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The *PRAXIS*® Study Companion

Middle School: Content Knowledge (5146)

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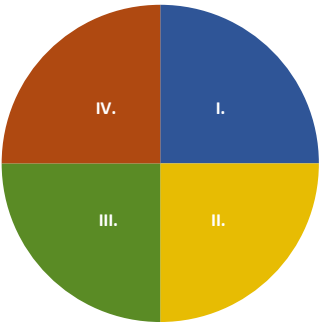
Table of Contents

Middle School: Content Knowledge (5146)

Test at a Glance

The *Praxis*® Middle School: Content Knowledge test is designed to measure knowledge and competencies that are important for safe and effective beginning practice as a middle school teacher.

Test Name	Middle School: Content Knowledge
Test Code	5146
Time	2 hours
Number of Questions	120 selected-response and numeric-entry questions
Format	The test consists of a variety of selected-response questions, where you select one or more answer choices; questions where you enter a numeric answer in a box; and other types of questions. You can review the possible question types in Understanding Question Types.
Calculator	Non-programmable calculator
Test Delivery	Computer Delivered

Content Categories	Approximate Number of Questions	Approximate Percentage of Examination
I. Literature and Language Studies	30	25%
II. Mathematics	30	25%
III. History/Social Studies	30	25%
IV. Science	30	25%

About The Test

The 120 selected-response test questions on the test focus on four subject areas that are considered central to all education: literature and language studies, mathematics, history/social studies, and science. Test questions are arranged in the test by subject area.

The test is not designed to be aligned with any particular curricula, but it is intended to be consistent with the recommendations of national studies on standards for teacher preparation. The ELA section of the test reflects the Standards for the English Language Arts (2012), by National Council of Teachers of English (NCTE) and the International Reading Association (IRA), and the Common Core State Standards for English Language Arts and Literacy (2010). The mathematics section of the test reflects the Standards for the Preparation of Middle Level Mathematics Teachers (2020), by the National Council of Teachers of Mathematics (NCTM) and the Council for the Accreditation of Educator Preparation (CAEP). The development of the science test questions reflects the National Science Education Standards (NSES) and the National Science Teacher Association (NSTA) standards. The social studies section of the test reflects the National Curriculum Standards for Social Studies: A Framework for Teaching, Learning, and Assessment (2010) by the National Council for the Social Studies (NCSS).

This test may contain some questions that will not count toward your score.

Content Topics

This list details the topics that may be included on the test. All test questions cover one or more of these topics.

Note: The use of "e.g." to start a list of examples implies that only a few examples are offered and the list is not exhaustive, whereas the use of "i.e." to start a list of examples implies that the given list of examples is complete.

Discussion Questions

In this section, discussion questions provide examples of content that may be included in the questions you receive on testing day. They are open-ended questions or statements intended to help test your knowledge of fundamental concepts and your ability to apply those concepts to classroom or real-world situations. Answers for the discussion questions are **not** provided; however, thinking about the answers will help improve your understanding of fundamental concepts and may help you answer a broad range of questions on the test. Most of the questions require you to combine several pieces of knowledge to formulate an integrated understanding and response. The questions are intended to help you gain increased understanding and facility with the test's subject matter. You may want to discuss these questions with a teacher or mentor.

I. Literature and Language Studies

Focus is on literature, language, and components of written and oral communication. Literature includes both expository and narrative texts and the written materials of all disciplines. Language Studies includes the processes of language development and the uses of language in written and oral communication. Questions allow examinees to demonstrate their knowledge and understanding of literature and language as well as their ability to think critically about relevant problems and to apply the principles of the language arts within diverse contexts

A. Literature (35%)

1. Literary concepts, conventions, terminology
2. Assumptions and conventions of primary literary genres, including children's literature
3. Social/historical contexts as they relate to
4. Approaches to reading and interpreting literature.

B. Language and linguistics (30%)

1. Basic stages of language development, including factors that enhance or inhibit this development
2. Historical and cultural influences on the evolution of standard American English
3. Principles of linguistics in analyzing various textual contexts
4. Integration of language across disciplines

C. Oral and written communication (35%)

1. Application of communication skills to analysis and production of written text
2. Application of communication skills to analysis of oral discourse
3. Rhetorical conventions of narration, exposition, reflection, and argumentation
4. Retrieval of information from print and nonprint sources
5. Interpretation of the written reports of research

Discussion Questions: Literature and Language Studies

- What specific and practical classroom activities can you envision using to teach a text such as Jack London's The Call of the Wild? For teaching Gwendolyn Brooks' "We Real Cool"?
- What are the phases of language development, especially for middle school students learning English?
- What are the characteristics of a middle school student new to the United States who is learning English and who is said to have "beginning proficiency" in English? "Intermediate proficiency"? "Advanced proficiency"?
- What are the most common errors that middle school students make in agreement and punctuation? What are some strategies for helping them to address these difficulties?
- How can meaning be affected by word order in a sentence?

- What is jargon? What are examples of jargon used in everyday language?
- What are some examples of ambiguity? What causes a sentence to be ambiguous?
- Why is reading important in a math class?
- What role does vocabulary play in a science class?
- How does the purpose or intended audience for a piece of writing shape its form?
- How does the discourse of the circumstances one writes for (professional, personal, creative) affect the form and tone of the writing?
- Select essays from books or journals and identify the author's main idea. Think about the ways in which authors support their arguments.
- How do stereotypes and biases interfere with constructing persuasive points of view?

II. Mathematics

Focus is on the mathematical understandings that middle school teachers must have, the ability to communicate these understandings, and the ability to solve mathematical problems.

Because the emphasis is on assessing the examinee's ability to reason logically, to use mathematical techniques in problem solving, and to communicate mathematical ideas effectively, examinees are not required to do much computation. Examinees may use non-programmable calculators while taking the test; a basic four-function calculator will be adequate.

The test questions do not require knowledge of advanced-level mathematics vocabulary but may require examinees to relate mathematics to real-life situations. Mathematics is conceptualized as an integrated field; therefore, a single problem may test several mathematical content areas.

Although few technical words are used in the test questions, terms such as area, perimeter, ratio, integer, factor, and prime number are used because it is assumed that these are commonly encountered in the mathematics that all examinees have studied.

A. Number sense and numeration (20%)

1. Understand the meaning/implication of number and number concepts as they relate to problem solving, using cardinal and ordinal numbers, place value, ordering of fractions, decimals, and whole numbers

B. Geometry (20%)

1. Knowledge of relationships in both two and three dimensions
2. Ability to draw inferences based on precepts/concepts of parallelism, perpendicularity, congruence and similarity, angle measures, and polygons

C. Measurement (5%)

1. Knowledge and application of standard units of both the English and metric systems, nonstandard units, estimation, perimeter, area, volume, mass, weight, angle measure, time, and temperature

D. Algebraic concepts (10%)

1. Recognize and apply algebraic concepts and properties
2. Describe patterns by writing or identifying a formula

E. Number theory (10%)

1. Problem solving that demonstrates an understanding of prime and composite numbers, divisibility rules, least common multiple, greatest common divisor, and set theory

F. The real number system and its subsystems (20%)

1. Solve real-world situational problems
2. Work with both standard and alternate algorithms

G. Probability and statistics (15%)

1. Understand the organization, presentation, and interpretation of data in various forms
2. Recognize valid and invalid inferences
3. Solve basic problems
4. Make predictions involving probability and statistics

Discussion Questions: Mathematics

- Be able to correctly solve problems involving the basic operations of addition, subtraction, multiplication, and division.
- What are common mistakes and misconceptions that students have when performing basic operations?
- Can you find the value of $\frac{44.2}{17}$?
- Be able to correctly solve problems involving the basic operations with fractions.
- What is the procedure for finding a common denominator and adding or subtracting fractions?
- What are common mistakes and misconceptions that students have when performing basic operations with fractions?
- Can you find the value of $\frac{1}{3} - \frac{2}{7}$?
- Can you find the value of $\frac{\frac{2}{3}}{\frac{4}{5}}$?

- Be able to use ratios, proportions, and percents to solve real-world problems.
- Be able to rank order data sets and lists of numbers.
- Be able to determine the place value of individual digits.
- What digit is in the hundredths place of 4,562.01327?
- Be able to convert from fractions to decimals, decimals to fractions, and fractions to percents.
- Be able to place fractions and/or decimals in the proper order on the number line.
- Which is greater, $\frac{2}{5}$ or 0.25 ?
- Be able to use estimation to determine if an answer is reasonable.
- Be able to use rounding to provide answers to the nearest unit required.
- Be able to identify congruent angles given two parallel lines and a transverse line.
- Be able to identify congruent triangles using the congruence theorems and postulates (e.g., Side-Angle-Side, Side-Side-Side).
- Be able to determine the measure of an angle in a triangle given the measures of the other two angles.
- Be able to apply the standard rules for comparing the sides of similar triangles.
- If triangle *ABC* is similar to triangle *DEF* and *AB* = 2, *BC* = 5, and *DE* = 3, can you find the length of side *EF* ?

- Be able to use the standard formulas for the area and perimeter of two-dimensional figures.
- If a rectangle has an area of 36 square inches and the length of the rectangle is 5 inches more than the width, can you find the perimeter of the rectangle?
- Be able to use the standard formulas for the volume and surface area of three-dimensional figures.
- Can you find the volume of a cylinder of radius 4 and height 5 ?
- Be able to find the missing length of a side of a right triangle given the length of the other two sides.
- Can you find the length of the diagonal of a square with sides of length 8 ?
- Be able to find the height of an isosceles or equilateral triangle given the lengths of the sides.
- Be able to find the area of an isosceles or equilateral triangle given the lengths of the sides.
- Be able to apply the triangle inequality.
- If an isosceles triangle has sides of integer length and two of the sides each have length 5, can you find the largest possible length for the third side?
- Be able to solve measurement problems in context.
- Be able to use conversion factors and/or provided formulas to solve measurement problems.
- Be able to convert feet to inches, meters to centimeters, and hours to seconds.

- Be able to solve an algebraic equation for one variable in terms of another.
- Be able to identify and use the commutative, associative, and distributive properties in order to solve algebraic equations.
- Can you find y in terms of x if $3x + 2y + 5 = 10$?
- Can you solve equations such as $2x - 0.35 = \frac{1}{5}$?
- Solve problems such as: If a car has been traveling for 20 minutes at a constant rate of 45 miles per hour, how many miles has it traveled?
- Can you solve equations such as $x^2 - 5x + 6 = 0$?
- What is the y-intercept of the graph of the parabola $y = -x^2 - x - 1$ in the xy-plane?
- What is the y-intercept of the graph of the line $4x - 3y + 7 = 0$ in the xy-plane?
- What is the equation of a line in the xy-plane perpendicular to the line $y = 2x + 3$ passing through the point $(-1, -1)$?
- Can you describe the set of all values of x so that $4 - x^2 \leq 0$?
- Be able to translate word problems into algebraic equations.
- Be able to distinguish between prime and composite numbers.
- Be able to list all prime numbers greater than 1 and less than 100.
- Be able to determine if an integer is divisible by 2, 3, 5 or 9.
- Can you find the prime factorization of 336 ?
- Can you find the least common multiple of 11 and 24 ?

- Can you find the greatest common divisor of 100 and 75 ?
- Be able to use approximations of π and $\sqrt{2}$ to solve real-world problems.
- If a swimming pool is in the shape of a right circular cylinder with a radius of 10 feet and a depth of 6 feet, can you find the volume of the pool to the nearest cubic foot?
- Be able to use scientific notation and order of magnitude approximation to solve problems involving very large or very small numbers.
- Be able to solve problems using the notions of intersection and union of sets.
- Can you draw a Venn diagram to illustrate the relationships among the set of integers, the set of rational numbers, and the set of real numbers?
- Can you calculate the weighted mean of a data set presented in a histogram?
- Can you find the mode of a list of numbers presented in a frequency table?
- Can you use line graphs to determine trends and make inferences?
- Be able to calculate the probability of an event as the number of favorable outcomes divided by the number of possible outcomes.
- Be able to calculate the probability of outcomes of mutually exclusive events and/or independent events.

III. History/Social Studies

Focus is on essential understanding of important historical events and issues and basic social science concepts. Because history and the social sciences are best seen as mutually enriching, most questions will require knowledge of both history and the social sciences.

Since critical thinking skills are integral to essential understandings, most questions will require the exercise of such skills. In many instances, examinees will be asked to utilize these skills in demonstrating an understanding of original documents, such as maps, charts, graphs, cartoons, and short quotations.

History: all questions in the History/Social Studies area require knowledge of history except for one question that has a non-historical perspective.

A. United States history (50%)

1. Native American civilizations
2. European exploration and colonization
3. The American revolution and the founding of
4. the nation
5. Growth of the new republic
6. The Civil War and Reconstruction: causes and consequences
7. Industrialization of America
8. World War I: causes and consequences
9. Post-World War I America
10. World War II: causes and consequences

B. World history (45%)

1. Prehistory and the development of early civilizations
2. Classical civilizations
3. Development of world religions
4. Feudalism in Japan and Europe
5. Chinese and Indian empires
6. Sub-Saharan kingdoms and cultures
7. Islamic civilization
8. Civilizations of the Americas
9. Rise and expansion of Europe
10. European developments
11. Nationalism and imperialism
12. 20th-century ideologies and conflicts

C. Nonhistorical perspective (5%)

1. Social science questions not posed in historical context

   Social Sciences: most questions in the History/Social Studies area require knowledge of social science as well as history. For those questions that require knowledge of both history and social science, the approximate percentages that require knowledge in each social science area are given below.

D. Government and politics (20%)

1. Political concepts and theories
2. United States political system

E. Geography (35%)

1. Map and globe skills
2. Physical geography
3. Cultural geography
4. Political geography
5. Economic geography
6. Regional geography

F. Economics (25%)

1. Basic economic concepts
2. Government's role in the economy

G. Anthropology and sociology (20%)

1. Definitions, research methods, techniques of study
2. Human culture, social organization
3. How cultures change

Discussion Questions: History/Social Studies

- Make your own timeline of United States history, starting with space for each century: 1400s, 1500s, 1600s, etc., (recognizing, of course, that Native Americans were here for thousands of years before that). Put the events listed in the study topics on your timeline in the correct century, then trace and describe in your own words important trends in cultural, intellectual, social, economic, political, and diplomatic history.

- Other trends to identify and describe in your timeline might include
  - Migration—patterns and effects
  - Technology—important developments and their effects
  - Urbanization—patterns and effects
  - Religions—dominant religions, conflicts with each other and government, influence on society and politics
  - The emergence of the United States as a world leader in the areas of military power, industry, finance, and politics

– The significance of the following dates in United States history: 1607, 1776, 1787, 1803, 1861–65, 1914–18, 1929, 1941–45

- What were the major similarities and differences in the economies, religions, governments, and cultures of native North American societies?

- What events occurring outside of the Americas caused Europeans and others to come to America?

- How were the New England, the middle, and the southern colonies different from each other? How were they similar?

- What were the weaknesses in the Articles of Confederation that eventually led to its replacement by the Constitution? How were the colonists' problems and frustrations with the British reflected in the articles?

- What were the major differences between the Federalists and Anti-Federalists?

- What are The *Federalist* papers and what are the most important principles expressed in them?

- Read the Constitution carefully in its entirety if you have not already done so.

- How did the Constitution deal with the issues of representation of slaves and the importation of slaves?

- What were the political and economic causes and outcomes of the War of 1812?

- How did Jacksonian Democracy influence United States social, political, and economic life?

- What was "Manifest Destiny" and how did it influence the expansion of United States territory?

- What was the impact of westward expansion on the United States economy?

- How did the outcome of the Mexican War affect sectionalism and the politics of western expansion and slavery between 1848 and 1860?

- What long-term trends or developments contributed to the growth of sectionalism?

- How did the regions try to resolve differences? How and why did those efforts succeed or fail?

- What were the roles of John C. Calhoun, Henry Clay, and Daniel Webster?

- What were the abolitionists' arguments? How did they pursue their agenda?

- What was the role of women in the abolitionist movement?

- What was the impact of the abolitionists' movement on the events of the period?

- What were the advantages that each side, the North and the South, enjoyed before the war began? What were each side's disadvantages?

- How did these shift during the war? How did they affect the outcome of the war?

- What did Reconstruction plans and policies accomplish, and where did they fail?

- What were the short- and long-term effects of the Compromise of 1877?

- What did the court rule in the case of Plessy v. Ferguson? How did the outcome of this case affect Americans for the next 58 years? What case overturned Plessy v. Ferguson?

- What were the "push" and "pull" factors that contributed to late-nineteenth-century immigration to the United States?

- On your timeline of United States history, take particular care with the immigration patterns in the nineteenth century, noting the decades during which immigrants from various countries or regions came to the United States in large numbers.

- Late-nineteenth-century immigration to the United States can be viewed in terms of creating a "melting pot" or a "pluralist" or "multicultural" society. What does this distinction mean, and why is it important?

- What reforms did Susan B. Anthony, W. E. B. DuBois, and Robert LaFollette lead?

- Compare and contrast Populism and Progressivism.

- What were the major successes, failures, and legacies of the New Deal?

- How were the "domino theory" and the policy of containment applied to United States foreign policy from the 1950s through the 1970s?

- What roles did individuals such as Ralph Nader, Rachel Carson, Betty Friedan, Dennis Banks, and Cesar Chavez play in social reform movements of the period?

- Why did the voting blocs supporting the major political parties become realigned beginning in the 1960s?

- Work with a globe or world map as you study and review world history. It would be especially useful to use a historical atlas so that you can see a place or region in its historical context. In addition, many recent world history textbooks have excellent maps. Find regions and places you are studying on the globe and make sure you understand the locations, movements, and relationships among the many societies you are reviewing.

- Think carefully about the periods into which this history is divided. You will probably find alternative schemes—that is, different names and year spans—in the materials you use for review. Why do historians divide history into periods? Do they agree on the names and dates of some periods more than on others? What do the periods say about historical interpretation? How do periods relate to long-term trends?

- Explain the significance of the following dates in world history: 220 c.e. and 476 c.e., 622 c.e., 1096–1099 c.e., 1200–1300, 1453, 1492, 1750–1780, 1789, 1870s, 1914–18, 1939–45, 1947, 1957, 1989.

- How did geography influence the civilizations of Egypt, Greece, and Rome?

- What similarities can you find in the establishment and influence of the Roman and Han empires? What factors led to the decline of these two empires?

- What factors led to the expansion of Islamic influence into India, North Africa, and sub- Saharan Africa?

- What similarities and differences were there in the practice of feudalism in Europe and Japan?

- How did the writings of Thomas Hobbes and John Locke influence the eighteenth-century Enlightenment philosophers?

- What were the key inventions that contributed to the rapid technological change described as the Industrial Revolution?

- What consequences did industrialization have for population distribution and the birth rates of industrializing nations?

- How did the treaties ending the First World War change the map of Europe?

- What factors contributed to political and economic instability in the world between 1918 and 1939?

- What similarities and differences are there in the causes and outcomes of the Chinese, Russian, and Mexican revolutions?

- Why were the colonies of European powers in Africa and Asia more successful in gaining independence after the Second World War than after the First World War?

- How did the end of the Cold War bring about changes in the political map of Europe?

- What are the main ideas of each theorist as they contribute to the development of forms of government and their institutions?

- Where did the ideas of sovereignty and social contract found in the United States Constitution come from?

- Where did the concepts of checks and balances and the separation of powers come from?

- How did the concepts of Marx and Lenin influence various forms of government in the twentieth century?

- What are the core ideas of each political orientation?

- What sorts of government or policy would each support, and why?

- What are the formal powers of each branch?

- What are the functions of checks and balances and the separation of powers?

- What are some examples of how the three branches check and balance each other?

- What impact do these relationships have on policy, responsibility, and authority? How have the relationships developed and changed over time? What factors drove those changes?

- What was the court's ruling in each of these cases? What were the short- and long-term effects of each?

- How could the rulings in these cases be modified by later Supreme Court rulings? What would cause this to happen?

- Be able to read and interpret various types of maps, including globe, climate, political, physical or topographic (including those with contour lines), thematic, and satellite maps.

- How are the imaginary lines of latitude and longitude organized on Earth to identify the absolute location of a place?
- Locate maps with scales for miles and kilometers. Practice measuring distances using each measurement of distance.
- Locate maps with keys for such factors as elevation, vegetation, climate zones. Practice drawing conclusions from the data illustrated by the key.
- Be able to define and distinguish between different types of landforms, including continents, isthmuses, peninsulas, plains, plateaus, and steppes.
- Be able to define and distinguish between different types of bodies of water and waterways, including oceans, seas, bays, estuaries, straits, canals, and rivers.
- How have the use, distribution, and importance of natural resources changed since the beginning of the twentieth century?
- What is the difference between weather and climate?
- Explain how each of the following factors influences climate: latitude, ocean currents, winds, mountains, elevation, and proximity to water.
- What cultural factors are commonly used to organize the world into cultural regions?
- What are the types of natural and artificial boundaries?
- What are the advantages and disadvantages of each type?
- Compare formal, or uniform, and functional regions.

- Why does the problem of scarcity force people to consider opportunity cost?
- How does an increase or decrease in productivity affect efforts to overcome the problem of scarcity?
- Why do people engage in exchange?
- What are the sources of gain from trade?
- What are the methods of economic organization? How do they differ?
- Why do nations impose trade restrictions? What impact do trade restrictions have on the economy?
- What are the laws of supply and demand?
- How is the market price of a good determined?
- How do markets adjust to changes in demand? How do markets adjust to changes in supply?
- What happens when prices are set above the market equilibrium price?
- What happens when prices are set below the market equilibrium price?
- How does the imposition of a tax affect a market?
- What are the differences between progressive, proportional, and regressive taxes?
- What is the difference between fiscal and monetary policy?
- What do economists expect the use of expansionary or contractionary policies to achieve?
- What effect can government spending have on the economy?
- What are the major functions of the Federal Reserve System?

- What are the major tools the Federal Reserve can use to control the supply of money?
- How do social institutions take part in the socialization of an individual into society?
- How does the socialization process change throughout the life cycle?
- What factors are commonly used in societies to establish social stratification?
- What part does ascribed or achieved status play in the degree of social mobility for an individual?

IV. Science

Focus is on the ability to demonstrate an understanding of scientific concepts, apply those concepts, identify problems, formulate and test hypotheses, design experiments, analyze and evaluate data, use both theoretical and practical models, and use instruments. Also includes the impact of science and technology on society and the environment. Because science is viewed as an integrated field, a single question may assess understanding of several content areas.

A. Life Science (33–34%)

1. Cellular biology: biologically important molecules, structure and function of cells and their organelles, energy sources and processes, and genes and gene function

2. Biology of organisms: life forms, structure and function of organ systems, and basic principles of heredity

3. Ecology, interrelationships in the biosphere: characteristics of ecosystems, energy flow in biological communities, and characteristics of biological communities

4. Evolution: evolutionary mechanisms, evolutionary patterns, evidence for evolutionary change, and history of life as related to the geological timeline

B. Earth and Space Science (33–34%)

1. Astronomy: the solar system and planetary systems, stars and galaxies, and cosmology

2. Geology: earth materials, internal processes, landforms and external processes, and the history of the Earth and its life-forms

3. Meteorology: atmospheric composition and structure, atmospheric movement, and weather and climate

4. Oceanography: biological, chemical, geological, and physical processes and characteristics

C. Physical Science (33–34%)

1. Matter: characteristics, structure, and physical and chemical properties

2. Reactions and interactions: kinetic theory, changes in state, chemical reactions, oxidation and reduction, acids and bases, catalysts, and chemical bonding

3. Macromechanics: straight line, projectile, circular, and periodic motion, Newton's laws of motion, gravity, weight, mass, and conservation laws

4. Energy: sources and transformations, and heat

16

5. Electricity and magnetism: static and current electricity, circuits, magnetism, and applications

6. Wave phenomena: electromagnetic spectrum, mirrors, lenses, sound production, and applications

7. Modern physics/nuclear chemistry: relativity, radioactivity, fusion, and fission

Discussion Questions: Science

- What unit is equivalent to 1/1,000th of a gram?

- How would you prepare 500 mL of a 3 *M* NaCl solution?

- What is a graduated cylinder used for?

- How are physical changes in a substance different from chemical changes?

- How are kinetic energy and potential energy different?

- What energy changes occur to a mass that starts from rest and slides without friction from the top to the bottom of an inclined plane? What additional energy changes occur when there is friction between the mass and the inclined plane?

- If 100 g of water at 20°C absorbs 5 kJ of heat, by what amount will the temperature of the water increase?

- When a reaction in solution produces energy, what happens to the temperature of the solution?

- How many neutrons are in $^{14}_{6}$C ?

- What are the formulas of compounds that form between Cl and elements that have one electron in their outer electron shell?

- Of the atoms He, H, Li, and Be, which is the smallest?

- What is an example of a nuclear reaction involving beta decay? Alpha decay?

- If a 100 g sample of a radioactive element decays to 25 g in 4 days, what is the half-life of the element?

- How does mass affect the acceleration of a falling object?

- What is meant by the term "terminal velocity"?

- A ball is dropped and another ball of smaller mass is fired horizontally from the same height. Which ball has a greater acceleration when it hits the ground? Which ball hits the ground first?

- What variables affect the period of a pendulum?

- What forces act on a frictionless air puck as it moves across a table at constant speed in a straight line?

- Why is it more difficult to slide a crate starting from rest than it is to keep it moving once it is sliding?

- If the speed of an object is doubled, by what factor does its kinetic energy change?

- Which requires more work: lifting a 100- kilogram sack a vertical distance of 2 meters or lifting a 50-kilogram sack a vertical distance of 4 meters?

- If the momentum of a 2,500 kg car is equal to the momentum of a 1,500 kg car moving at 5 m/s, what must be the speed of the 2,500 kg car?

- When a moving object collides with an object at rest, is it possible for both objects to be at rest after the collision?

- What is the difference between an elastic collision and an inelastic collision?

- What happens to the angular velocity of a rotating platform as a person walks from the outer rim of the platform toward the center of the platform?

- If the distance between two masses is doubled, what happens to the gravitational force between the two masses?

- Why does a sheet of paper on a table rise when air is blown across the top surface of the paper?

- If the distance between two charges is halved, what happens to the electrostatic force between the two charges?

- If three 10-ohm resistors are connected in parallel, what is the equivalent resistance of the parallel combination?

- Why are metals good conductors of heat and electricity?

- Describe the orientation of the magnetic field lines of a bar magnet.

- When a bar magnet is moved toward a stationary conducting loop, in which direction does the induced current in the loop flow?

- Why does the sky appear blue when viewed from the surface of Earth?

- What is the fundamental difference between interference and diffraction?

- How do polarized sunglasses reduce the glare from reflective surfaces, such as the surface of a lake?

- When you blow over a bottle, what happens to the frequency of the sound produced as you fill the bottle with water?

- What is the range of wavelengths of visible light?

- What color light is transmitted through a piece of blue glass? Why?

- What is always true of the images formed by concave lenses?

- Describe image formation in a plane mirror.

- Does the size of the image in a plane mirror change as the object moves away from the mirror?

- What is the relationship between the position of an element on the periodic table and the distribution of electrons in the atoms of the element?

- Of the elements Na, Mg, Al, P, S, and Cl, which has the highest first ionization energy?

- Of the elements K, Fe, Cu, and Ag, which will react most readily with Cl?

- How many oxygen atoms are in 3 moles of CO_2 ?

- How many H atoms are in calcium hydroxide, Ca(OH)2 ?

- What is the formula for sodium oxide?

- Of the compounds Na_2S , Na_2SO_4 , and Na_2SO_3, which is called sodium sulfate?

- What are the molecular formulas for ethanol, ethanal, and butane?

- What kinds of bonding are exhibited by the compounds KCl, MgO, CO_2, and H_2?
- What are the arrangement and motions of molecules of substances in the solid phase? Liquid phase? Gaseous phase?
- If a sample of gas is heated at a constant pressure, what will happen to the volume of the gas?
- What effect does the rate of evaporation have on the size of salt crystals that form when water evaporates from a saltwater solution?
- Balance the following equation: $Na + MgSO_4 \rightarrow Mg + Na_2SO_4$.
- In general terms, what will happen to the chemical equilibrium

  $2\ NO_2\ (g) \rightarrow N_2O_4(g) + 58\ kJ$ if the temperature, pressure, or concentration of one of the reactants is changed?

- In an electrochemical cell, $Cd \rightarrow Cd^{2+}$, is Cd oxidized or reduced?
- If a solute is completely dissolved in a solvent, is the solution saturated or unsaturated?
- Why is ammonia gas very soluble in water while oxygen, O_2, is only slightly soluble?
- Will a substance dissolve faster if it is ground into a powder first?
- Will increasing temperature always increase solubility?
- What is the general function of buffer mixtures?
- What will happen to the pH of an aqueous solution of HCl when a base such as NaOH is added?

- What structures would you expect to find in a typical plant cell but not in an animal cell? What functions do these unique structures carry out for the plant?
- If you were stranded in a lifeboat on the ocean, why would drinking the ocean water be more harmful than not drinking the water?
- What are the major differences between "normal" cells and cancerous cells? Chemotherapy is the use of chemicals to kill rapidly dividing cells. In addition to killing many types of cancer cells, why does chemotherapy treatment cause side effects such as anemia, gastrointestinal distress, and hair loss?
- At the cellular level, what is the benefit of exercising aerobically? Why do muscles become "sore" after excessive exercise?
- What makes bread "rise" before it is baked?
- Describe Watson and Crick's model for DNA structure.
- How are Mendel's laws related to the behavior of chromosomes during the formation of gametes?
- What percentage of offspring will have blood type A if the parents have blood types AB and O? What percentage will have blood type O?
- How has recombinant DNA technology been used to solve criminal cases? To treat diabetes?

- A small percentage of individuals with Down syndrome possess a chromosomal translocation in which a copy of chromosome 21 becomes attached to chromosome 14. How does this translocation occur?

- A radioactive meteorite falls to Earth and kills 90 percent of a secluded population of salamander. What mechanisms are in action changing allelic frequency in this population's gene pool?

- Explain the following concepts relative to Darwin's theory of the origin of species: a) Descent with modification, b) Struggle for existence, and c) Survival of the fittest

- How would the presence of molecular oxygen, O_2 , in the atmosphere affect early living things

- What are the limitations of the five-kingdom system? Current debates about revising the five-kingdom system center mainly on which groups of organisms?

- Consider a seed planted upside down three inches under the soil. When the seed germinates, why does the root grow downward into the soil while the shoot grows upward?

- Under what environmental conditions would you expect the transpiration rate to be the highest in an average-sized oak tree? The lowest?

- Why must the human body digest large macromolecules into small monomers before it can use them? What enzymes does the human body use to digest these macromolecules?

- Of proteins, carbohydrates, fats, and alcohols, which type of nutrient has the highest caloric value per gram?

- What are the structural and functional differences between the three muscle types, i.e., skeletal, smooth, and cardiac?

- What are some genetic, lifestyle, and internal physiological factors that can lead to hypertension (high blood pressure)? If hypertension is uncontrolled, what health problems can occur? What types of treatments exist to help control hypertension?

- Why are insulin and glucagon considered "antagonistic" hormones? Are there other such hormone pairs in the human body?

- What is the principle of competitive exclusion?

- How have humans accelerated the process of the greenhouse effect? What is the environmental impact of this accelerated greenhouse effect?

- Create a food web, with organisms placed within an appropriate trophic level, with the following organisms: zooplankton, eagle, freshwater shrimp, green algae, goose, mouse, beetle, bacteria, trout, bear, and mushroom. What would the pyramids of number, biomass, and energy look like for this ecosystem? Describe the levels of DDT you would find in the tissues of the members of the community if the pesticide DDT were introduced into this food web.

- Compare the types of vegetation encountered with increasing altitude (e.g., traveling up a mountainside) and with increasing latitude (i.e., traveling from the Equator toward the North Pole).

- What makes a topographic map different from any other map? Why is a topographic map useful to a geologist?

- What are the source materials for the ingredients of sedimentary rocks?

- What does the behavior of seismic waves reveal about the structure and physical characteristics of Earth's interior?

- What evidence exists for "continental drift" and how is continental drift different from plate tectonics?

- What processes occur at plate boundaries?

- What are the major agents of erosion?

- What is radioactive dating and how is it used to provide dates for the geologic time scale?

- How can fossils be useful to a geologist in correlating the north and south walls of the Grand Canyon?

- Why do waves break as they approach the shore?

- How do the Sun and Moon influence tides? Why, in general, do two high tides occur at a given location every day?

- What is the Coriolis effect and how does it affect Earth's surface waters?

- What are black smokers and how do they form?

- What is seafloor spreading? Explain the origin of the rift valley in the center of the mid- oceanic ridge.

- List the layers of the atmosphere and discuss the temperature changes within each.

- How does the Sun influence global and local winds?

- Why do weather systems generally move across the United States from west to east?

- Compare and contrast tornadoes and hurricanes.

- What weather would you predict for the next day if you observed a lowering sequence of stratiform clouds over a day or two?

- What influence does one or more of the following have on the climate of a region: ocean currents, landforms, and world wind belts?

- How does a volcanic eruption affect both regional and worldwide climate conditions?

- How far does light travel in a light-year?

- What information about stars and their life cycle can be obtained form a Hertzsprung- Russell (H-R) diagram?

- How do the Sun and other stars generate their energy?

- Why do lunar and solar eclipses not occur every month?

- Compare the temperature and length of the day at the North Pole, the midlatitudes, and the Equator on June 21 and on December 21.

- Why does the length of daylight change from day to day?

- What is the relationship between a time zone, longitude, and Earth's rotation?

- What limitation of Earth-based telescopes has been solved by the Hubble space telescope?

- Compare the availability and limitation of the following sources of power: geothermal, nuclear, hydroelectric, solar, and fossil fuel.

- Since plastic products do not readily decompose in waste sites, what is an alternative for plastic disposal?

- Compare and contrast the depletion of mineral resources with that of fossil fuels.

- Give examples of how events such as the clear-cutting of the tropical rain forests and building of nuclear energy plants have had both positive and negative impacts on humans and the environment.

Middle School: Content Knowledge (5146) Sample Test Questions

Sample Questions

The sample questions that follow represent a number of the types of questions and topics that appear on the test. They are not, however, representative of the entire scope of the test in either content or difficulty. Answers with explanations follow the questions.

Directions: The test consists of a variety of selected-response questions, where you select one or more answer choices, and questions where you enter a numeric answer in a box.

I.   Literature and Language Studies

1.

   1) Early 20th-century studies of spoken Native American languages proved otherwise.

   2) That flexibility was evidenced, in part, by the complexity and range of Native American oral literature.

   3) Linguists once believed that peoples without an elaborate written literature had no more than a few hundred words in their vocabulary.

   4) Each language studied contained at least 20,000 words.

   5) In addition to copiousness, the spoken languages were found by linguists to be as flexible as languages with a written tradition.

   Which of the following represents the best ordering of the sentences above into a coherent paragraph?
   (A)   1, 2, 3, 4, 5
   (B)   3, 1, 4, 5, 2
   (C)   3, 2, 1, 5, 4
   (D)   5, 3, 2, 4, 1

Questions 2–4 are based on the following excerpt from Thousand Pieces of Gold, by Ruthanne Lum McCunn.

Polly laid her forehead against the cold pane of glass. Outside a meadowlark sang, its haunting melody reminding her of the three robins she had saved after Mr. Grostein's cat had killed the birds' mother.

At first, they were content to fly around her room, but soon they began pecking at the window, demanding to be let out. So Charlie built a cage for them, and Polly hung the cage on a tree outside. But their cries tore at her, and finally she opened the door, letting them fly where they pleased. Then one day Mr. Benson, the butcher, came to the saloon and handed her a cigar box with three stiff bodies crusted with blood.

He was sorry, he said. He knew how much the birds meant to her, and he had reprimanded his clerk severely. But the way they hovered, demanding scraps, had been annoying, and if she had kept them in the cage Charlie had made for them, his clerk would not have killed them.

Charlie had told her the same thing, and she had tried to explain why, even though she mourned the birds' deaths, she did not regret leaving them uncaged. But he had not understood. Then how could she make him understand her own need to escape the cage that held her?

2. The central analogy presented in the passage suggests which of the following?

    (A) Mr. Benson understood better than Charlie how Polly felt about the birds.
    (B) Polly would prefer to be free, even if she suffered as a result.
    (C) Polly had at one time been imprisoned but had managed to escape.
    (D) Charlie was correct in believing that the birds were better off caged than free.

3. The narrative suggests that Polly feels her relationship with Charlie is

    (A) new and fragile
    (B) loving but argumentative
    (C) caring but flawed
    (D) frivolous and demeaning

4. Which of the following best describes Polly's mood as it is presented in the passage?

    (A) Hostile
    (B) Self-recriminating
    (C) Disinterested
    (D) Pensive

ə abut ᵊ kitten ər further a back ā bake ä cot, cart
aů out ch chin e less ē easy g gift i trip ī life
j joke ŋ sing ō flow ȯ flaw ȯi coin th thin <u>th</u> this
ü loot ů foot y yet yü few yů furious zh vision

5. According to the pronunciation guide above, which of the following words would be represented as "

    (A) Telepathy
    (B) Typographer
    (C) Topography
    (D) Telegraphic

6. Freewriting, brainstorming, clustering, and idea mapping are most important during which stage of the writing process?

    (A) Prewriting
    (B) Drafting
    (C) Revising
    (D) Proofreading

7. Set in the American Civil War, the novel concerns a young soldier's first encounter with battle and the psychological changes that he undergoes. Published in 1895, the novel had a great influence on 20th-century fiction.

    The novel discussed above is

    (A) Andrea Davis Pinkney's Silent Thunder
    (B) Gary Paulsen's Soldier's Heart
    (C) Stephen Crane's The Red Badge of Courage
    (D) Carolyn Reeder's Shades of Gray

8. _____is a narrative that takes abstract ideas of behavior—good or bad, wise or foolish—and attempts to make them concrete and striking. The chief actor in these stories is usually an animal or inanimate object that behaves like a human and engages in a single significant act intended to teach a moral lesson.

    Which of the following will correctly complete the passage above?

    (A) A myth
    (B) A fable
    (C) An epic
    (D) A legend

9. Identify which of the following characteristics apply to each of the two poetic forms.

   For each characteristic, choose one poetic form.

10. After John had drilled eight holes, he noticed that the edge of the wood was cracked.

    The sentence is an example of which of the following sentence types?

    (A) simple
    (B) compound
    (C) complex
    (D) compound-complex

11. Though Josh mentioned that she was a good friend, Anna knew it was a hollow compliment.

    In the sentence above, the word "hollow" is best defined as

    (A) deep
    (B) sunken
    (C) vicious
    (D) insincere

12. The paragraph below is a draft written by a student.

    Samantha is a great basketball player. She sometimes scores as many as twenty points a game, and she helps our team win again and again. Samantha is also a great friend. She is really great and always shares her snacks with other kids on the team.

    Which of the following resource books would best help the student author to develop a more effective description of Samantha within her draft?

    (A) An encyclopedia
    (B) A thesaurus
    (C) A grammar guide
    (D) A dictionary

13. Everyone in my school has that video game. It is obviously the best video game out there. I need it too, or everyone will think I am backward.

    The argument above is ineffective because it suffers from which of the following logical fallacies?

    (A)   Straw man
    (B)   Ad hominem
    (C)   Bandwagon
    (D)   Post hoc

14. A teacher is working with an eighth-grade student who reads at the fifth-grade level. When the student encounters an unknown word, "cohabit," the teacher breaks the word into parts and has the student determine the meaning of "co" and the meaning of "habit," using words with the same prefix or root, such as "coworker" and "habitat."

    The activity described above relies most directly on knowledge of which of the following language concepts?

    (A)   Morphemes
   (B)   Synonyms
    (C)   Phonemes
    (D)   Orthography

II.   Mathematics

ANN'S LIVING ROOM

12 ft

18 ft
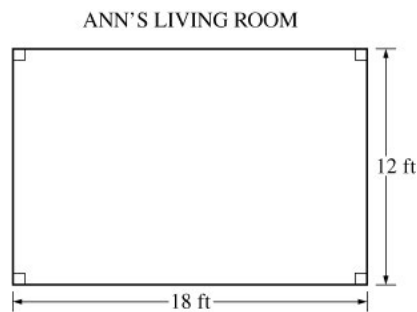
15. Ann plans to place a continuous wallpaper border on the walls of her living room, which is represented in the figure shown. Each roll costs $6.47, and no partial rolls are sold. If each roll of border is 8 feet long, what is the minimum amount Ann can spend on rolls of border to complete her project?

    (A) $45.29
    (B) $51.76
    (C) $103.50
    (D) $174.69
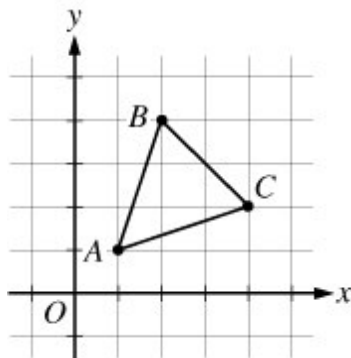
16. In the *xy*-plane, the triangle *ABC* is to be reflected about the *y*-axis to form triangle *A'B'C'*. What will be the coordinates of *C'*?

(A) (−4, −2)
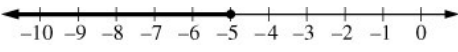(B) (−4, 2)
(C) (−2, −4)
(D) (−2, 4)
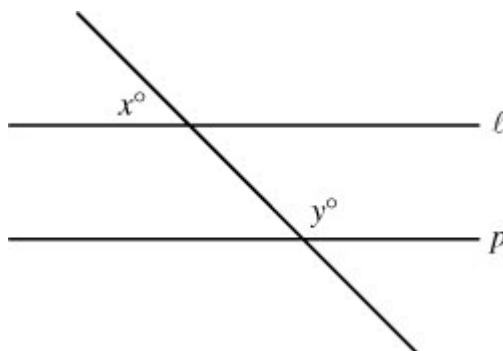
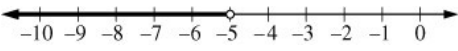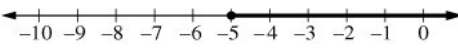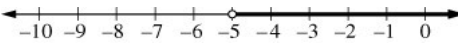

17. In the figure shown, line ℓ and line *p* are parallel, and $y = 3x$. What is the value of *x* ?

(A) 30
(B) 45
(C) 60
(D) 75

18. Reggie hiked 3,500 meters along a trail at a nearby park each day for the last 14 days. How many kilometers did Reggie hike in the last 14 days?
(Note: 1,000 meters = 1 kilometer)

19. The original price of a certain car was 25 percent greater than its cost to the dealer. The actual selling price was 25 percent less than the original price. If c is the cost of the car to the dealer and p is the selling price, which of the following represents p in terms of c ?

   (A) $p = 1.00c$
   (B) $p = 1.25c$
   (C) $p = 0.25(0.75c)$
   (D) $p = 0.75(1.25c)$

$$-4x + 1 \geq -21$$

20. Which of the following represents the solution set for the inequality shown?

   (A)

   (B)

   (C)

   (D)
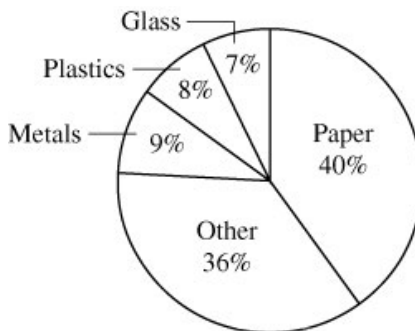
21. The graph shows the distribution of the contents, by weight, of a county's trash. If approximately 60 tons of the trash consists of paper, approximately how many tons of the trash consist of plastics?

   (A) 24
   (B) 20
   (C) 15
   (D) 12

22. If a student takes a test consisting of 20 true-false questions and randomly guesses at all of the answers, what is the probability that all 20 guesses will be correct?

(A) $\left(\dfrac{1}{2}\right)^{20}$

(B) $\dfrac{1}{2(20)}$

(C) $\dfrac{1}{20}$

(D) $\dfrac{1}{2}$

III. History/Social Studies

23.

ESTIMATED POPULATION OF AMERICAN COLONIES, 1630 AND 1750		
	1630	1750
New England		
White Inhabitants	1,796	349,029
Black Inhabitants	0	10,982
Middle Colonies		
White Inhabitants	340	275,723
Black Inhabitants	10	20,736
Southern Colonies		
White Inhabitants	2450	309,588
Black Inhabitants	50	204,702
Total		
White Inhabitants	4,586	934,340
Black Inhabitants	60	236,420

Which of the following is a correct statement supported by the chart above?
(A) Religion was a powerful force opposing slavery in the American
(B) Slavery grew rapidly throughout the American colonies despite restrictions on the slave trade.
(C) Southern landholders preferred the labor of indentured servants to slave labor.
(D) By 1750, the southern colonies had become demographically distinct from the other colonies.

24. "We hold these truths to be self-evident: that all men and women are created equal; that they are endowed by their Creator with certain inalienable rights; that among these are life, liberty, and the pursuit of happiness; that to secure these rights governments are instituted, deriving their powers from the consent of the governed. Whenever any form of government becomes destructive of these ends, it is the right of those who suffer from it to refuse allegiance to it, and to insist upon the institution of a new government."

– Seneca Falls Declaration of Sentiments
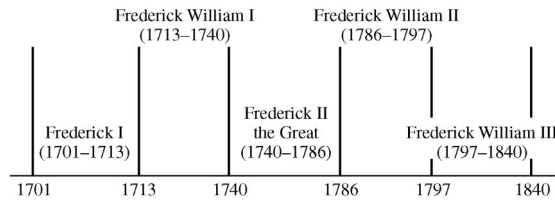
and Resolutions, 1848

The excerpt above is from a major declaration of which of the following movements?
(A) Abolitionism
(B) Revivalism
(C) The women's rights movement
(D) The public school movement
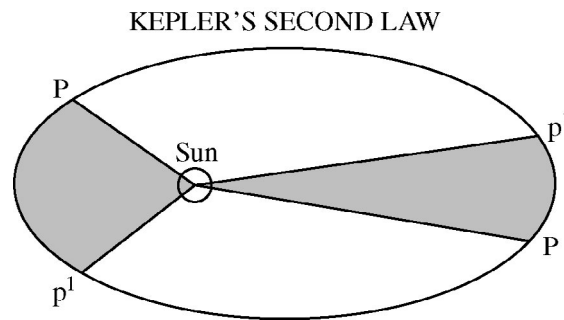
KEPLER'S SECOND LAW

25. The diagram above of the second law of Johannes Kepler illustrates that Kepler believed that

(A) the Earth was the center of the universe and the Sun revolved around the Earth
(B) the language of mathematics could describe the movements of the planets
(C) planetary motion was random and not subject to human understanding
(D) there were only four planets in the Solar System

Frederick William I (1713–1740) · Frederick William II (1786–1797) · Frederick I (1701–1713) · Frederick II the Great (1740–1786) · Frederick William III (1797–1840)

1701 · 1713 · 1740 · 1786 · 1797 · 1840

26. The timeline above of the Hohenzollern rulers of Prussia is misleading primarily because it

   (A) omits essential information about each ruler
   (B) omits other events of historical importance
   (C) lists only male rulers of the Hohenzollern dynasty
   (D) spaces the reigns, not the years, equally

27. European interest in the Middle East grew significantly in the 20th century primarily because

   (A) Europe became interested in settling part of its growing population in the Middle East
   (B) many European countries began hiring guest workers from the Middle East
   (C) the Middle East became a significant producer of a critical natural resource that Europe sought
   (D) the Middle East became a large potential market for European goods

28. Which of the following resulted from President Franklin D. Roosevelt's New Deal?

   (A) All large banks were nationalized.
   (B) The United States Supreme Court gained two new justices.
   (C) The national government grew in size, scope, and responsibility.
   (D) Decisions about welfare spending were entrusted to the states

IV. Science

29. Which of the following is true about hurricanes?

    (A) They form only over warm oceans.
    (B) They generally form over landmasses.
    (C) They generally last no more than an hour or so.
    (D) They generally range in size from hundreds of meters to a few kilometers at most.

30. Of the following methods of producing electricity, which contributes most to acid rain in North America?

    (A) Solar panels
    (B) Nuclear power plants
    (C) Power plants that burn fossil fuels
    (D) Wind turbines

31. Which of the following is (are) produced by photosynthesis?

    (A) Carbon dioxide
    (B) Carbohydrates
    (C) Proteins
    (D) Lipids

32. Of the following parts of an atom, which has the smallest mass?

    (A) Nucleus
    (B) Neutron
    (C) Proton
    (D) Electron

33. Which of the following describes exocytosis?

    (A) Shrinking of the cell
    (B) Export of molecules out of the cell
    (C) Division of the nucleus
    (D) Splitting of the cell membrane

34. Which of the following is true about Earth's inner core?

   (A)   The inner core is primarily gaseous.
   (B)   The inner core is primarily liquid.
   (C)   The inner core is primarily solid.
   (D)   The inner core alternates between being liquid and being solid due to temperature
         fluctuations.

35. A 5-ohm resistor and a 10-ohm resistor are connected in series with an ideal 45-vold
   battery. The current in the circuit is equal to

   (A)   3 amps
   (B)   5 amps
   (C)   9 amps
   (D)   45 amps

36. Which THREE of the following systems are directly required for movement in a vertebrate
   animal?

   (A)   The muscular system
   (B)   The digestive system
   (C)   The skeletal system
   (D)   The nervous system

Answers

Literature and Language Studies

1. Option (B) is correct. Only sentence 3 has characteristics that both introduce a paragraph and contain a suggestion of the way the ideas in the paragraph will be developed. The words "once believed" in sentence 3 anticipate the counter assertion in sentence 1, which introduces the example of Native American languages. Sentence 4 provides specific support to sentence 1. The introductory phrase in sentence 5 refers to the number of words mentioned in sentence 4. Further, sentence 5 introduces the notion of flexibility, which is restated and developed in sentence 2

2. Option (B) is correct. The central analogy links Polly's feelings of confinement and desire for freedom to the plight of the birds she had released from their cage. She did not regret her action although the birds' freedom had led to their deaths.

3. Option (C) is correct. Charlie tried to protect the birds for Polly and to solve the problem they presented by caging them. He regretted that they had been killed. Polly longs to have Charlie understand what she is feeling; there is no suggestion, however, of angry confrontation. The passage presents evidence of caring but also of a failure of communication.

4. Option (D) is correct. The characterizations of Polly in the first and last paragraphs suggests reflection, not hostility or self-reproach or disinterest.

5. Option (C) is correct. The first syllable contains a schwa vowel sound and the second the vowel sound in the word "cot." The third syllable contains a schwa vowel sound, and the fourth contains the sound of the vowels in the word "easy."

6. Option (A) is correct. The terms mentioned are processes and devices associated with generating new ideas and organizing them.

7. Option (C) is correct. The passage presents factual information and a brief description of the plot of The Red Badge of Courage by Stephen Crane.

8. Option (B) is correct. The statements on which the question is based constitute a definition of a fable.

9. The correct answers are haiku, limerick, limerick, limerick, and haiku. Haikus are composed of 17 syllables (5 in the first line, 7 in the second line, and 5 in the third line) and are often focused on nature. Limericks are composed of 5 lines that follow a strict rhyme scheme, and they often center on nonsensical ideas.

10. Option (C) is correct. Complex sentences contain one independent clause and one or more dependent clauses. "After John had drilled eight holes" is a dependent clause, and "he noticed that the edge of the wood was cracked" is an independent clause. The example contains one independent clause and one dependent clause.

11. Option (D) is correct. The use of the word "though" in the clause "Though Josh mentioned that she was a good friend" indicates that the compliment was not sincere.

12. Option (B) is correct. The student could use a thesaurus to locate synonyms for "great." Use of these synonyms would help to clarify the type of person that Samantha is by providing a more specific description of her.

13. Option (C) is correct. The bandwagon fallacy is the suggestion that one should join a cause or adopt a behavior because of its popularity, not because of any reasoned argument for it.

14. Option (A) is correct. Knowledge of morphemes is knowledge of the affixes, combining forms, and roots of words. This knowledge builds vocabulary, and it is necessary for the kind of word analysis described in the activity

Mathematics

15. Option (B) is correct. The minimum length of wallpaper border needed to decorate the room is equal to the perimeter of Ann's living room. The perimeter is the sum of the lengths of the four walls of the room, or $18 + 18 + 12 + 12 = 60$ feet. The number of rolls of border needed is determined by dividing the perimeter by the length of each roll of border, and $\frac{60 \text{ feet}}{8 \text{ feet}} = 7.5$. Therefore, Ann needs a minimum of 7.5 rolls, and since no partial rolls are sold, she must buy 8 rolls. The cost of 8 rolls of the border is found by multiplying the cost of each roll, $6.47, by the number of rolls needed, so the final answer is $6.47 \times 8 = \$51.76$.

16. Option (B) is correct. The coordinates of point C are (4, 2). When a point is reflected over the y-axis, the x-coordinate of the point changes to its opposite, but the y-coordinate remains the same, so (4, 2) is transformed to (−4, 2), which means the coordinates of C' are (−4, 2).

17. Option (B) is correct. The properties of angles associated with parallel and transversal lines can be used to show that the angle with measure x degrees and the angle with measure y degrees are supplementary angles. Recall that the sum of the measures of supplementary angles is 180°. That is, $x + y = 180$. It is given that $y = 3x$. Substituting for y, you get $4x = 180$. Hence, $x = 45$.

18. The correct answer is 49 kilometers. Reggie hiked 3,500 meters along a trail each day for 14 days, so Reggie hiked 3,500 × 14 = 49,000 meters during that time. Since there are 1,000 meters in 1 kilometer, dividing 49,000 by 1,000 gives the final answer: that Reggie hiked 49 kilometers in the last 14 days.

19. Option (D) is correct. This question asks you to apply your knowledge of percent increase or decrease to determine a selling price based on cost of a car to the dealer, c. Since the original price of the car was 25 percent greater than the cost to the dealer, the original price was $c + 0.25c = 1.25c$. Since the selling price was 25 percent less than that amount, only 75 percent of that amount was paid, and therefore the selling price of the car, p, is equal to (0.75)(1.25c).

20. Option (A) is correct. To determine which option represents the solution set for the inequality, subtract 1 from each side of the inequality and then divide each side of the inequality by −4. Remember that when multiplying or dividing both sides of an inequality by a negative number, the direction of the inequality symbol needs to be reversed. Thus, the equivalent inequality is $x \leq -5$. The option that represents the set of all real numbers less than or equal to −5 is option (A).

21. Option (D) is correct. One of the ways to solve the problem is to use the information about the trash that consists of paper to find the total weight of the county's trash, and then use this information to find how many tons of the trash consist of plastics. The problem states that 60 tons of the trash consists of paper, and the graph shows that this amount equals 40% of the total, so 60 = 0.4 × (total weight of trash) and the total weight of trash is $\frac{60}{0.4}$ = 150 tons. Then, the weight of trash that consists of plastics equals 8% of 150 tons, or (0.08)(150), which equals 12 tons. Alternatively, the problem can be solved using the fact that the ratio of plastics to paper in the trash is the same, whether the two amounts are given as percents or in tons. This gives the proportion $\frac{\text{tons of plastics}}{\text{tons of paper}} = \frac{8\%}{40\%}$ or $\frac{\text{tons of plastics}}{60} = \frac{8}{40}$, and when the proportion is solved the same answer of 12 tons is obtained.

22. Option (A) is correct. The probability that the student guesses any one answer correctly is $\frac{1}{2}$, and since the student is randomly guessing, the guesses are independent events, so $\frac{1}{2}$ needs to be multiplied by itself 20 times. Thus, the probability of guessing all 20 answers correctly is $\left(\frac{1}{2}\right)^{20}$.

History/Social Studies

23. Option (D) is correct. While (A), (B), and (C) might have some truth for some aspects of the population of the different regions, (D) is the only claim supported by the table.

24. Option (C) is correct. The Seneca Falls Declaration is associated with the women's rights movement.

25. Option (B) is correct. The diagram reflects the mathematical concept of an ellipse, which is defined as the set of all points, the sum of whose distances from two fixed points is constant.

26. Option (D) is correct. The reigns are spaced equally, the years are not. There are only 12 years shown between Frederick I and Frederick William I. Frederick William I ruled for 27 years, and Frederick II the Great ruled for 26 years. Frederick William II ruled for only 11 years, and Frederick William III ruled for 43 years.

27. Option (C) is correct. It was in the 20th century that technological advances throughout the world increased the demand for oil and made it economically beneficial to mine the oil of the Middle East countries. This need for larger quantities of crude oil increased European interest in the politics and economics of the area.

28. Option (C) is correct. Roosevelt's New Deal established a wide range of new federal agencies concerned with issues including financial regulation of the economy, social welfare, and economic development, thereby expanding the size, scope, and responsibility of the national government. Banks were not nationalized, the size of the Supreme Court did not expand, and decisions about welfare spending were concentrated in the federal government.

Science

29. Option (A) is correct. Hurricanes require warm ocean surface waters in order to develop. Hurricanes derive their energy from these warm waters and from the release of heat when water vapor in the atmosphere condenses. Hurricanes can last for a number of days, and based on the location of hurricane-force winds, their average size can be 100 miles in diameter.

30. Option (C) is correct. Acid rain is caused by the reaction of sulfur oxides and nitrogen oxides with water in the atmosphere. The burning of fossil fuels is a major source of these oxides. The other answer choices do not produce these oxides.

31. Option (B) is correct. Photosynthesis produces carbohydrates. Carbon dioxide is not a product but is a reactant that is used in the process. Proteins and lipids are not produced by photosynthesis.

32. Option (D) is correct. Of the parts of an atom listed in the choices, the electron has by far the smallest mass. The proton and the neutron both have a mass more than 1,800 times greater than the mass of an electron. The nucleus, which includes protons and neutrons of varying numbers depending on the atomic number of the atom, has a much greater mass than an electron.

33. Option (B) is correct. Exocytosis is a form of active transport in which molecules are transported out of a cell.

34. Option (C) is correct. The inner core of Earth is solid. The outer core is liquid.

35. Option (A) is correct. The current in the circuit is 3 amps. The current of the circuit can be found from the equation $V = IR$, in which V is the voltage, I is the current, and R is the resistance. The total resistance is equal to (5 + 10) ohms, and the voltage is 45 volts. The current I is equal to V/R = 45 volts/15 ohms = 3 amps.

36. Options (A), (C), and (D) are correct. The muscular system, the skeletal system, and the nervous system are all directly required for movement in a vertebrate animal. The digestive system is not directly required.

Understanding Question Types

The *Praxis*® assessments include a variety of question types: constructed response (for which you write a response of your own); selected response, for which you select one or more answers from a list of choices or make another kind of selection (e.g., by selecting a sentence in a text or by selecting part of a graphic); and numeric entry, for which you enter a numeric value in an answer field. You may be familiar with these question formats from seeing them on other standardized tests you have taken. If not, familiarize yourself with them so that you won't have to spend time during the test figuring out how to answer them.

Understanding Selected-Response and Numeric-Entry Questions

For most questions you will respond by selecting an oval to choose a single answer from a list of answer choices.

However, interactive question types may also ask you to respond by doing the following.

- Selecting more than one choice from a list of choices.

- Typing in a numeric-entry box. When the answer is a number, you may be asked to enter a numerical answer. Some questions may have more than one entry box to enter a response. Numeric-entry questions typically appear on mathematics-related tests.

- Selecting parts of a graphic. In some questions, you will select your answers by selecting a location (or locations) on a graphic such as a map or chart, as opposed to choosing your answer from a list.

- Selecting sentences. In questions with reading passages, you may be asked to choose your answers by selecting a sentence (or sentences) within the reading passage.

- Dragging and dropping answer choices into targets on the screen. You may be asked to select answers from a list of choices and to drag your answers to the appropriate location in a table, paragraph of text, or graphic.

- Selecting answer choices from a drop-down menu. You may be asked to choose answers by selecting choices from a drop-down menu (e.g., to complete a sentence).

Remember that with every question, you will get clear instructions.

Understanding Constructed-Response Questions

Some tests include constructed-response questions, which require you to demonstrate your knowledge in a subject area by writing your own response to topics. Essay questions and short-answer questions are types of questions that call for a constructed response.

For example, an essay question might present you with a topic and ask you to discuss the extent to which you agree or disagree with the opinion stated. For such questions, you must support your position with specific reasons and examples from your own experience, observations, or reading.

Following are a few sample essay topics to review:

- *Brown* v. *Board of Education of Topeka*

  "We come then to the question presented: Does segregation of children in public schools solely on the basis of race, even though the physical facilities and other 'tangible' factors may be equal, deprive the children of the minority group of equal educational opportunities? We believe that it does."

  A. What legal doctrine or principle, established in *Plessy* v. *Ferguson* (1896), did the Supreme Court reverse when it issued the 1954 ruling quoted above?

  B. What was the rationale given by the justices for their 1954 ruling?

- *In his self-analysis, Mr. Payton says that the better-performing students say small-group work is boring and that they learn more working alone or only with students like themselves. Assume that Mr. Payton wants to continue using cooperative learning groups because he believes they have value for all students.*

  o Describe **TWO** strategies he could use to address the concerns of the students who have complained.
  o Explain how each strategy suggested could provide an opportunity to improve the functioning of cooperative learning groups. Base your response on principles of effective instructional strategies.

- *"Minimum-wage jobs are a ticket to nowhere. They are boring and repetitive and teach employees little or nothing of value. Minimum-wage employers take advantage of people who need a job."*

  o Discuss the extent to which you agree or disagree with this opinion. Support your views with specific reasons and examples from your own experience, observations, or reading.

Keep the following things in mind when you respond to a constructed-response question.

1. **Answer the question accurately.** Analyze what each part of the question is asking you to do. If the question asks you to describe or discuss, you should provide more than just a list.

2. **Answer the question completely.** If a question asks you to do three distinct things in your response, you should cover all three things for the best score. Otherwise, no matter how well you write, you will not be awarded full credit.

3. **Answer the question that is asked.** Do not change the question or challenge the basis of the question. You will receive no credit or a low score if you answer another question or if you state, for example, that there is no possible answer.

4. **Give a thorough and detailed response.** You must demonstrate that you have a thorough understanding of the subject matter. However, your response should be straightforward and should not be filled with unnecessary information.

5. **Take notes on scratch paper so that you don't miss any details.** Then you'll be sure to have all the information you need to answer the question.

6. **Reread your response.** Check that you have written what you intended to write. Do not leave sentences unfinished or omit clarifying information.

General Assistance For The Test

Praxis® Interactive Practice Test

This full-length *Praxis*® practice test lets you practice answering one set of authentic test questions in an environment that simulates the computer-delivered test.

- Timed just like the real test
- Correct answers with detailed explanations
- Practice test results for each content category

ETS provides a free interactive practice test with each test registration. You can learn more here.

Doing Your Best

Strategy and Success Tips

Effective *Praxis* test preparation doesn't just happen. You'll want to set clear goals and deadlines for yourself along the way. Learn from the experts. Get practical tips to help you navigate your Praxis test and make the best use of your time. Learn more at Strategy and Tips for Taking a *Praxis* Test.

Develop Your Study Plan

Planning your study time is important to help ensure that you review all content areas covered on the test. View a sample plan and learn how to create your own. Learn more at Develop a Study Plan.

Helpful Links

Ready to Register – How to register and the information you need to know to do so.

Disability Accommodations – Testing accommodations are available for test takers who meet ETS requirements.

PLNE Accommodations (ESL) – If English is not your primary language, you may be eligible for extended testing time.

What To Expect on Test Day – Knowing what to expect on test day can make you feel more at ease.

Getting Your Scores – Find out where and when you will receive your test scores.

State Requirements – Learn which tests your state requires you to take.

Other Praxis Tests – Learn about other *Praxis* tests and how to prepare for them.

To search for the *Praxis* test prep resources
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