ACT®

CONNEC ME EDUCATION

ACT® International Subject Tests

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Student Information Pack: Preparing for the ACT International Subject Tests

Physics

Chemistry

Biology
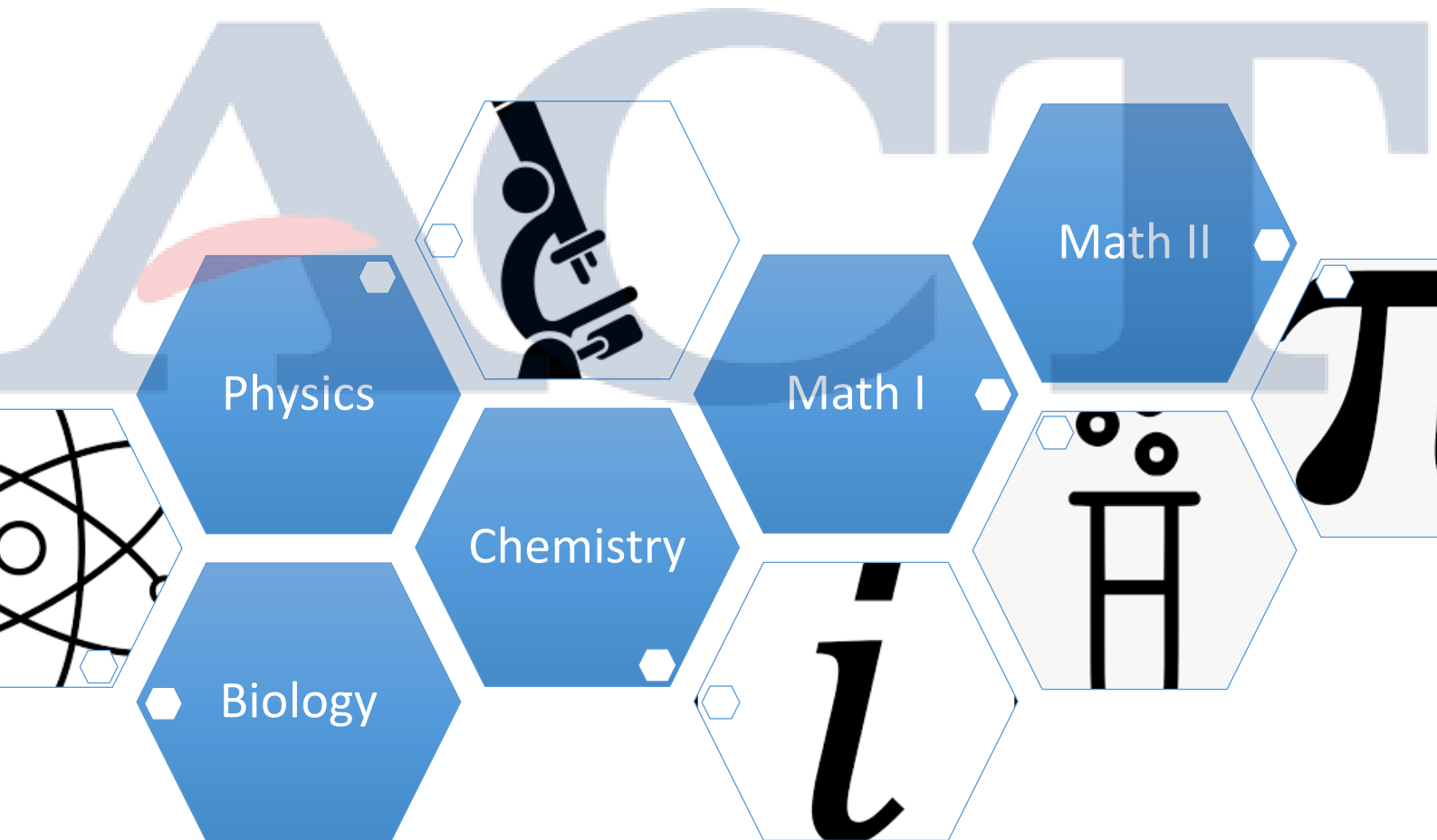
Math I

Math II

Find out more: connecme.actclub.org
2020-2021

Contents

A Message To Students

This booklet is an important first step as you get ready for your Education and for your future. The information here is intended to help you get a better idea about the ACT International Subject Tests, and to be able to do your best on them to gain admission to colleges and universities.

Included are overviews of the material on the tests, as well as practice questions made with "retired" questions from earlier tests given.

Read this booklet carefully and take the practice tests well before the test day. That way, you will be familiar with the tests, and you can do your best on test day.

You may also want to consider visiting connecme.actclub.org for more information.

ACT International Subject Test is a unique, research-based assessment. Based on research and designed in partnership with the nation's leading educators, the assessment offers a comprehensive, aligned approach to measuring student skills and knowledge.

The ACT International Subject tests are designed to be related to be aligned to your high school curriculum, whether you are studying the national, IB, or US Common Core, you will find a subject test that works for you and rewards you on your excellence in your school year.

Biology
Biology test questions ask students to solve problems and demonstrate understanding of topics including: Biochemistry and the Cell, Genetics and Evolution, and Animal and Plant systems and Ecology.

Chemistry
Chemistry test questions ask students to solve problems and demonstrate understanding of topics such as: states of matter and phase changes, mole concept, chemical formulas, chemical equations, stoichiometry, gas laws, atomic structure, periodicity, chemical bonding, solution properties. Chemistry test questions ask students to apply proportional reasoning and other mathematical thinking to solve problems.

Physics
Physics test questions ask students to solve problems and demonstrate understanding of topics such as: forces and motion (e.g., displacement, velocity, acceleration, momentum, force, impulse, Work-Energy theorem, power, work), fundamental forces (e.g., Newton's law of gravitation, Coulomb's law. Physics test questions ask students to apply proportional reasoning, graphical models, and other mathematical thinking to solve problems.

Mathematics I (Algebra, Geometry)
Students can affirm the Algebra and Geometry skills typically developed through the first years of secondary school. These skills include solving equations, drawing conclusions from data, finding areas and volumes, and making judgments about proofs. Calculators are allowed, and a reference sheet provides common formulas.

Mathematics II (Algebra II, Pre-Calculus)
Students can affirm their advanced Algebra and pre-Calculus skills. These skills include understanding complex numbers, modeling with vectors and matrices, applying advanced functions, finding limits, fitting a normal distribution, and interpreting graphs in the polar coordinate plane. Calculators are allowed, and a reference sheet provides common formulas.

U.S. History
U.S. History test covers a detailed overview of United States history, from the country's beginnings to the post–World War II era. Test questions ask student to show knowledge and insight into the forging of the new nation, the sectional conflicts that nearly tore it apart, and the Civil War and Reconstruction. Student needs to know topics such as: nineteenth-century industrialization and urbanization, the growth of the West and the "New South," and political efforts to reform capitalism. Student should be able to investigate and interpret past events, and apply what you have learned to real-world situations.

English I / English II
ACT Subject tests for English 1 and 2 assess students' knowledge, skills, and abilities as readers and writers. Questions use a diverse collection of authentic, high-quality texts that have been taught in successful classrooms across the United States, including drama, fiction, nonfiction, and poetry texts, as well as film scripts. The English tests also assess knowledge and skills required to write effectively in high school and college

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Please Read carefully.

- When you take the ACT Subject Tests, please think carefully about all the choices in each question and answer.
- Plan to use the allotted time as follows:
  - ✓ Answer the easy questions first.
  - ✓ Work on less time-consuming questions.
  - ✓ Move to more challenging questions giving them enough time.
- Make educated guesses: eliminate choices you know for sure they are wrong.
- Work at steady pace and keep track of time.

On Test Day
You can feel calm and prepared for test day by knowing what you can and cannot bring into the test room with you.

Items to Bring for Testing:

- A printed copy of your admission ticket with photo, which is required for entry to the test center.
- A photo ID, as specifically requested in correspondence and outlined on the ticket.
- An acceptable calculator if taking a science or math subject test.
- A non-digital watch (The testing room will have a clock, but you're allowed to bring a non-digital watch).
- Keep your ID and admission ticket with you at all times, especially if you leave the testing room. You may be asked to show your ID or admission ticket at any time while in the test center. Don't write on the admission ticket.

Items NOT to Bring for Testing:

- Smart watch features and audible alarms are prohibited.
- Textbooks, foreign language or other dictionaries, scratch paper, notes, or other aids.

- Any electronic device, other than a permitted calculator (this includes your mobile phone, smart watch, fitness band, media player, iPad, headphones, and camera)
- Reading material

Calculators
Students are encouraged, but not required, to bring an approved scientific calculator on the following ACT Subject Tests:
- Math I
- Math II
- Chemistry
- Physics

Scientific calculators are available as on-screen tools within all four of the subject tests listed above. Therefore, if students do not bring an approved calculator with them to the testing location, they will be able to use the on-screen version.

The following types of calculators are **prohibited:**

- Calculators with built-in computer algebra systems—Prohibited calculators in this category include:
  - Texas Instruments: All model numbers that begin with TI-89 or TI-92 and the TI-Nspire CAS—*Note: the TI-Nspire (non-CAS) is permitted.*
  - Hewlett-Packard: HP Prime, HP 48GII, and all model numbers that begin with HP 40G, HP 49G, or HP 50
  - Casio: Algebra fx 2.0, ClassPad 300, ClassPad 330, fx-CP400 (ClassPad 400), and all model numbers that begin with CFX-9970G
- Handheld, tablet, or laptop computers, including PDAs
- Electronic writing pads or pen-input devices—*Note: The Sharp EL 9600 is permitted.*
- Calculators built into cell phones or any other electronic communication devices
- Calculators with a typewriter keypad (letter keys in QWERTY format)—*Note: Letter keys not in QWERTY format are permitted.*

Biology

The ACT International Subject Test in Biology is modular, consisting of two 38 item multiple-choice modules.

Each module will be 45 minutes long.

The assessment covers topics that are generally identified in most high school level Biology courses. The test is built with the rigorous high school Biology course in mind: one that covers primary aspects of the discipline, including cells and their functions; introductory Biochemistry; Genetics; Animals, Plants, and the relationships among organisms; Ecology; and Evolution. In addition, it explores the foundations and practices of science in general, teaches the basic processes of scientific inquiry, and emphasizes the importance of mathematics and measurement.

Skills and Concepts Covered in the Test:
What students should know about the ACT International Subject Test of Biology: It encompasses the following overarching themes and/or foundational concepts:

- Exploring and Defining the Fundamental Unifying Concepts, Organization, and Inquiry Techniques Underlying the Science of Biology

- Investigating Life Processes at the Cellular Level and Understanding Both How These Processes Work and How They Are Maintained and Regulated

- Delving in to Heredity by Investigating How Genetic Structures and Processes Provide the Mechanism for Continuity and Variety Among Organisms

- Investigating Processes That Allow Populations to Change in Response to Different Environmental and Genetic Pressures

- Identifying and Deciphering the Distinguishing Characteristics of All Categories of Living Things and Establishing the Genetic, Ancestral, and Behavioral Relationships Among Them

- Analyzing the Ecological Processes by Which Living Things Interact with Their Environments and with Each Other

Recommended Pre-requisites:
1 year high school level Biology course
1 year high school level Mathematics (minimum Algebra)

Content on the Test: Biology

Biology Process

• Scientific Inquiry
    • Math and Measurement in Science
    • Science in Practice
    • Foundations in Biology

Biochemistry; Cell
• Biochemistry   • Investigating Life Processes at the Cellular level and Understanding both how These Processes Work and How They are Maintained and Regulated
Genetics; Evolution
• Delving into Heredity by Investigating How Genetic Structures and Processes Provide the Mechanism for Continuity and Variety Among Organisms   • Investigating Processes That Allow Populations to Change in Response to Different Environmental and genetic pressures
Animal/Plant Systems and Ecology
• Identifying and Deciphering the Distinguishing Characteristics of All Categories of Living Things and Establishing the Genetic, Ancestral, and Behavioral Relationships Among Them   • Analyzing the Ecological Processes by Which Living Things Interact With Their Environments and With Each Other

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Sample Questions

Below are 10 sample multiple choice questions from the ACT International Subject Test: Biology

1. Chan wants to determine how much the mass of fungus growing on a nutrient agar plate changes over an 8 hour period. What is the most appropriate unit of measure for him to use?

    a. Kilogram
    b. Kilometer
    c. Milligram
    d. Millimeter

2. Which experiment design would provide scientists with the best data for investigating which type of feed yields the greatest gain in lean muscle mass in cattle?

    a. Test 5 different types of cows with the same feed mixture and measure their weight gain at the end of a 6 week trial.
    b. Test 5 similar groups of cows with 5 different feed mixtures and measure their weight gain at the end of a 6 week trial
    c. Test 5 similar groups of cows with the same feed mixture, give each group varying amounts of feed, and measure their weight gain at the end of a 6 week trial.
    d. Test 5 different types of cows with 5 different feed mixtures give each group varying amounts of feed and measure their weight gain at the end of a 6 week trial

3. Shown below is a growth curve for Paramecium grown in a 1.0L flask containing pond water at 20°C The pond water is continually filtered to remove waste products, and nutrients are added at a constant rate.
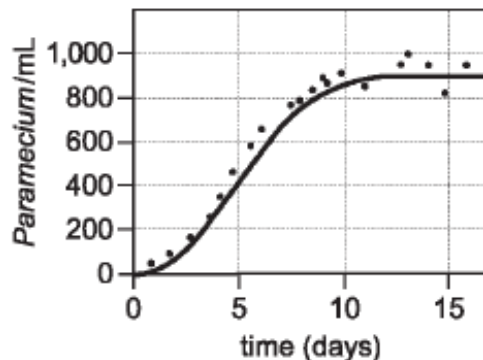
    How could the experiment be modified to determine whether temperature influences the population size of Paramecium?

    a. Repeat the procedures described using 1 flask, and increase the temperature to 25°C for Days 10-15
    b. Repeat the procedures described using 1 flask, and vary the temperature randomly during the entire incubation time.
    c. Repeat the procedures described using 2 flasks incubate 1 flask at 15°C and the other at 25°C.
    d. Repeat the procedures described using 2 flasks incubate both flasks at 20° C

4. A researcher counted the number of eggs a single fruit fly laid in 24 hours for 5 days and recorded the findings in this table:

Day	Number of eggs
1	10
2	14
3	7
4	8
5	11

What is the average number of eggs laid per day over the 5 days?
- a. 5
- b. 10
- c. 25
- d. 50

5. Ella told her sister the sun would set at 6:30 pm and there would be a full moon on Thursday night. Under which basic assumption of science is she operating?

- a. Nature is orderly
- b. Knowledge is superior to ignorance
- c. Nothing is self-evident
- d. All phenomena have natural causes

6. Edison studies the effects of temperature on starch digestion in a test tube. He adds 2g of starch and 1ml of enzyme suspension to a test tube and incubates it at 25°C for 20 min. To accurately test the effects of temperature, Edison should begin a second test with 2g of starch in a test tube and continue with which set of conditions?

- a. 1 mL of enzyme suspension incubated at 25°C for 10 min
- b. 1 mL of enzyme suspension incubated at 37°C for 20 min
- c. 2 mL of enzyme suspension incubated at 25°C for 20 min
- d. 2 mL of enzyme suspension incubated at 37°C for 10 min

7. Which processes generates most of the ATP produced during cellular respiration?

- a. Electron transport chain
- b. Fermentation
- c. Glycolysis
- d. Krebs Cycle

8. Which functional group found in amino acids is absent from monosaccharides, polysaccharides, fatty acids and glycerol?

- a. $-COOH$
- b. $-NH_2$
- c. $-OH$
- d. $-PO_4$

9. Stephanie adds cycloheximide to cells grown in a test tube. Within minutes, she identifies short incomplete segments of proteins in the cells. On which organelle does cycloheximide act?

- a. Endoplasmic reticulum
- b. Golgi apparatus
- c. Nucleus
- d. Ribosome

10. When comparing 2 populations of animals, which state most likely indicates that they are the same species?

- a. They produce fertile offspring
- b. They inhabit the same general area
- c. Their outward appearance is similar
- d. They consume the same type of diet

Chemistry

The ACT International Subject Test in Chemistry is modular, consisting of two 38 item multiple-choice modules.

Each module will be 45 minutes long.

The makeup of the physical world, from the properties and structures of matter to the laws explaining the activity of gases is explored, as are the chemical structures of elements, molecules, and compounds. Like other Chemistry courses, a rigorous course studies the periodic table of elements and the proper symbolic nomenclature of elements as well as the symbolic representation of chemical reactions in formulas and equations. Investigations into the microscopic world lead to deeper understanding of the macroscopic world, from atomic structure and bonding to the properties of salts, acids, and bases. More advanced subjects, such as REDOX reactions or nuclear chemistry, are also introduced in

a rigorous Chemistry course. In support of students' introduction to the discipline, a rigorous course emphasizes the foundations and practices of science in general, teaching the basic processes of scientific inquiry and emphasizing the importance of mathematics and measurement.

Skills and Concepts Covered:
What students should know about the ACT International Subject Test of Chemistry:
It encompasses the following overarching themes and/or foundational concepts:

- Understanding Chemistry as Inquiry
- Exploring the Physical World
- Discovering the Language of Chemistry
- Building Models of Matter
- Integrating the Macroscopic, Microscopic, and Symbolic Worlds

Recommended Pre-requisites
1 year high school level Chemistry course with laboratory experience

1 year high school level Mathematics (minimum Algebra)

Content on the Test: Chemistry

Introduction to Chemistry
- Introduction to Chemistry
- Mass, Volume, Density
- Elements, Atomic Mass and Nomenclature
- The Language of Chemistry
- Formulas Equations
- Moles +
- Chemical Equations and Stoichiometry

Structure of Matter
- Properties of Matter & Gas
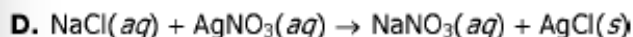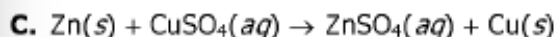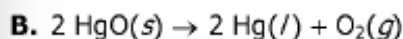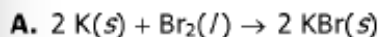- Building Models of Matter

Solution Chemistry
- Integrating Macroscopic Microscopic and Symbolic Worlds
- Types of Solution Concentration Solubility
- Kinetics, Equilibrium and Thermodynamics
- Salts, Acids and Bases
- REDOX Reactions and Electrochemistry
- Nuclear Chemistry

Sample Questions

Below are 10 sample multiple choice questions from the ACT International Subject Test: Chemistry

1. What is volume, in mL, of a sample of glycerol with a density of 1.20 g/mL and a mass of 43.7g?
    a. 36.4
    b. 42.5
    c. 44.9
    d. 52.4

2. Which representation is a structural formula?
    a. O
    b. HO
    c. H_2O_2
    d. H-O-O-H

3. Which statement correctly describes 1 mole of iodine (I_2)
    a. Its mass is 126.9 g
    b. Its mass 380.7 g
    c. It contains 6.02×10^{23} atoms
    d. It contains 6.02×10^{23} molecules

4. Which balanced chemical equation is a single replacement reaction?

    A. $2 K(s) + Br_2(l) \rightarrow 2 KBr(s)$

    B. $2 HgO(s) \rightarrow 2 Hg(l) + O_2(g)$

    C. $Zn(s) + CuSO_4(aq) \rightarrow ZnSO_4(aq) + Cu(s)$

   **D.** $NaCl(aq) + AgNO_3(aq) \rightarrow NaNO_3(aq) + AgCl(s)$

5. A student measures the mass of an American nickel on an analytical balance and records a results of 4.947g in her laboratory notebook. The US Mint has a specification of 5.000g for the mass of a nickel. Assuming the US Mint's specification is the actual mass of a nickel, what is the percent error associated with the student's measurement?
    a. 1.071%
    b. 1.060%
    c. 0.01071%
    d. 0.01060%

6. At high temperatures, tantalum(V) oxide(Ta_2O_5) reacts with carbon (C) to produce tantalum (Ta) and carbon dioxide (CO_2)

    $2 Ta_2O_5(s) + 5 C(s) \rightarrow 4Ta(s) + 5 CO_2(g)$

    Greg adds 2.34g of Ta_2O_5 to an excess of C in a crucible. Using a Bunsen burner, he heats the mixture until CO_2 is no longer released Greg isolates 1.75g of Ta. What is the percent of yield of Ta for this reaction?
    a. 37.4%
    b. 54.6%
    c. 74.8%
    d. 91.3%

7. Which type of bond involves the transfer of electrons?
    a. Covalent bond?
    b. Hydrogen bond
    c. Ionic bond
    d. Metallic bond

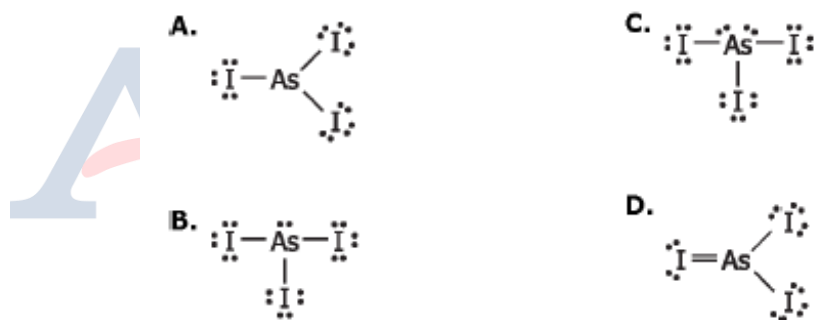8. The representations show 4 different types of atomic orbitals. Which type of atomic orbital contains the outermost electron in a neutral neon (Ne) atom?

A.

C.

B.

D.
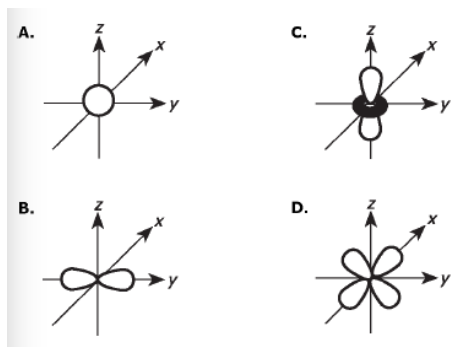
9. Which list contains elements arranged in order of increasing electronegativity?
   a. Be, B, C, F
   b. Br, Se, Ga, K
   c. N, P, As, Sb
   d. O, Ge, In, Hg

10. Which is the Lewis dot structure of arsenic triiodide (AsI_3)

A.

B.

C.

D.

Physics

The ACT International Subject Test in physics is modular, consisting of two 38 item multiple-choice module.

Each module will be 45 minutes long.

The strength of the course is that it covers topics that are generally identified in most high school level one that introduces the foundations of physics. Through investigations of motion in one and two dimensions, students gain familiarity with the kinematic concepts of displacement, velocity, and acceleration; momentum, force, work, energy, and power; Newton's laws of motion; and conservation laws. Building upon these foundations, students pursue careful, inquiry-based study of the fundamental forces of gravitation and electromagnetism, along with the properties and behavior of phenomena that can be modeled using waves, including sound, light, and harmonic oscillation.

Skills and Concepts Covered in the Test:
What students should know about the ACT International Subject Test of Physics:
It encompasses the following overarching themes and/or foundational concepts:

- Understanding Physics as Inquiry

- Understanding and Applying Knowledge of Forces and Motion

- Understanding and Applying Knowledge of Fundamental Forces

- Understanding and Applying Knowledge of Waves and Periodic Motion

- Understanding modern physics

Recommended Pre-requisites:
1 year high school level Physics course
1 year high school level Mathematics (minimum Algebra)

Content on the Test: Physics

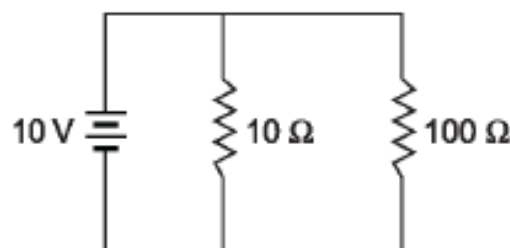| Forces and Motion |
| --- |
| Speed Velocity, Acceleration One and Two Dimensional Motion Work and Energy Momentum Newton's Law |
| **Fundamental Forces**
Gravity Electrical Charges & Coulomb's Law Electrical Potential and Electrical Fields Magnetism Electrical Circuits |
| **Waves and Periodic Motion D**
Wave Properties Periodic Motion Sound Waves Light Waves |

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Sample Questions

Below are 10 sample multiple choice questions from the ACT International Subject Test: Physics

1. Which statement about the velocity and acceleration of an object traveling in a circle at a constant speed is true?
   a. Neither the velocity nor the acceleration is constant
   b. Both the velocity and acceleration are constant
   c. The acceleration is constant, but the velocity is not
   d. The velocity is constant, but the is not acceleration

2. A 15kg crate initially at rest on a horizontal floor requires 60.0 N of horizontal force to move. Determine the coefficient of static friction between the crate and the floor.
   a. 0.25
   b. 0.41
   c. 2.5
   d. 4.0

3. Four identical springs evenly support a steel bock of weight W. The elastic constant of each spring is k. Which expression gives the distance of compression from equilibrium?
   a. $\sqrt{\frac{W}{2k}}$

   b. $\sqrt{\frac{8W}{k}}$

   c. $\frac{W}{4k}$

   d. $\frac{4W}{k}$

4. In which situation is mechanical energy conserved?
   a. A parachutist jumps from an airplane and comes to terminal velocity due to air friction
   b. A box is kicked across a level floor and stops after sliding a few feet
   c. A spring oscillates up and down without any change in amplitude
   d. A ball is dropped to the floor and bounces back to half the height from which it was dropped

5. Robert's mass is 55.00kg during soccer practice he runs up a set of stairs in 5.00s. The total vertical height of the stairs is 6.00m. What is Roberto's power output, in watts?
   a. 66.00
   b. 108.00
   c. 647.
   d. 3234

6. A 2000 kg spaceship is 11.00 x 10^5 m above Earth's surface. What is the gravitational force, in Newtons acting on the spaceship?
   a. 1.65 x 10^4
   b. 1.90 x 10^4
   c. 1.23 x 10^{11}
   d. 1.35 x 10^{11}

7. What is the equivalent resistance, in ohms in this circuit?
   a. 0.11
   b. 9.09
   c. 90.0
   d. 110

8. Mima prepares 4 identical foam beads, each carrying same charge +q. She places 1 beat at each of 3 corners and 1 bead at the center of a square of diagonal length 2r, as shown in this figure.
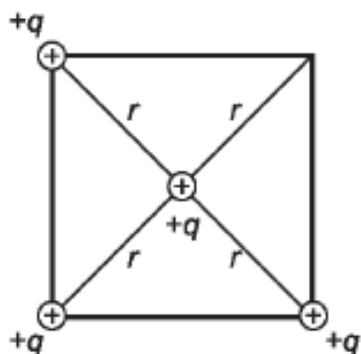
What is a magnitude of the net force on the bead t the center of the square?

A. 0

B. $\dfrac{kq^2}{r^2}$

C. $\dfrac{2kq^2}{r^2}$

D. $\dfrac{kq^2}{?r^2}$

9. A laser beam travels from water with an index of refraction of 1.33 into glass with an index of refraction 1.50. The angle of refraction is 40 °. What is the angle of incidence?
   a. 34.7°
   b. 46.5°
   c. 58.7°
   d. 74.6°

10. A light wave has an intensity of 200 W/m^2 The amplitude of the light wave is tripled. What is the intensity of the light, in W/m^2?
   a. 22.2
   b. 66.7
   c. 600
   d. 1800

Math I and Math II

The ACT International Subject Test in Math I and Math II consists of 50 item multiple-choice components.

The assessment will be 60 minutes long.

1. The structure of real numbers, algebraic expressions, equations, and inequalities, and the classes of functions.

2. Algebraic concepts which include items such as:
   - linear equations,
   - inequalities,
   - functions and systems,

3. Axioms or postulates.

4. Problems and relationships that lead to theorems that must be proved.

5. Properties of plane figures from line segments to rays, angles, polygons, and circles; the properties of solids; perimeter, area, and volume; as well as similarity, congruence, and symmetry.

6. Geometric concepts which are presented through several approaches to geometry (e.g., Euclidean, coordinate, transformational), and introduction to trigonometry.

7. Exploration of number systems from real to complex numbers.

8. Algebra II which includes quadratic equations and inequalities; polynomials; rational and radical expressions, equations, and functions; exponential and logarithmic functions; and trigonometric and periodic functions.

9. Analyzing data by exploring probability, sequences, and series and by introducing matrices and that is through Algebra II.

10. Exploration the behavior of functions to understand the significance of abstract properties of functions and graphs— including domain, range, invertibility, and behavior under transformations such as stretching, shrinking (pre-calculus).

11. Functions and relations as geometric objects that can be classified according to type, discovering the significance of short-run phenomena by viewing graphs close-up such as local extrema and discontinuities.

12. Functions, relations, and transformations through the rigorous study of;
    - matrices,
    - conic sections,
    - polar coordinates,
    - complex numbers,
    - vectors, parametric equations, and
    - sequences and series.

.
Recommended Pre-requisites:
Math I : High school level Mathematics (Algebra I, Geometry)
Math II : High school level Mathematics (Algebra II, Pre-Calculus)

Content on the Test: Math I

Algebra I
- Number Sense, Operation and Graph Skills
- Equations and Functions Using Linear Expressions
- Equations and Functions Using Quadratic Expressions
- Equations and Functions Using Other Nonlinear Expressions
- Data Relations

Geometry
- Logic and Proof
- Properties of Geometric Figures.
- Comparing Geometric Figures
- Measurement, Coordinate Geometry, and Trigonometry

Content on the Test: Math II

Algebra II
- Linear Functions
- Number Sense, Quadratic Functions, and Matrices
- Polynomial Functions
- Other Functions: solve rational and radical equations
- Probability, Sequences, and Series

Pre-Calculus
- Polynomial Functions; Data Analysis
- Conic Sections and Advanced Functions
- Trigonometric and Periodic Functions
- Polar Coordinates, Vectors, and Matrices
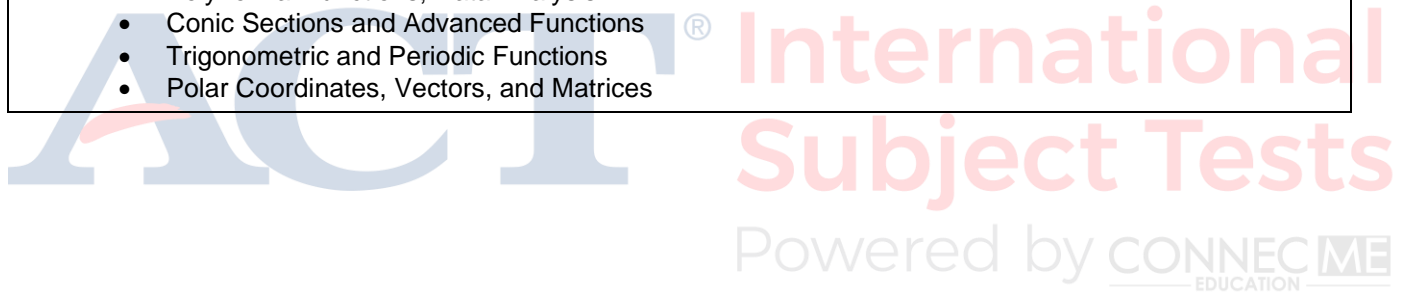
Sample Questions

Below are 10 sample multiple choice questions from the ACT International Subject Test: Math I

1. The amount, a, earned by Hari and Desmond by depositing money for a period of time, t, is the solution to these equations:

$$\begin{cases} 2a = 1600t + 20000 \\ 1.5a = 1280t + 14500 \end{cases}$$

   What is the solution to this system of equations?

   a. t = 0.2, a = 20, 320
   b. t = 0.2, a = 10, 160
   c. t = 6.25, a = 30,000
   d. t = 6.25, a = 15,000

2. In the coordinate plan, $\overleftrightarrow{n}$ passes through the points (-1, 4) and (5,2) and $\overleftrightarrow{m}$ passes through the points (2,1) and (4,y). For what value of y is $\overleftrightarrow{n}$ perpendicular to $\overleftrightarrow{m}$?

   a. $-\frac{1}{3}$

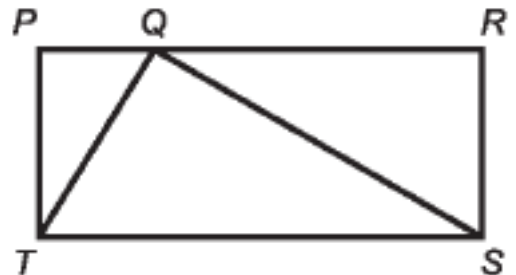   b. $\frac{1}{3}$

   c. 5

   d. 7
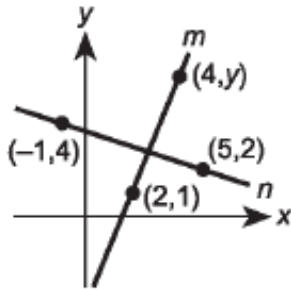
3. Two unique rays determine an angle. How many different angles do 10 rays with a common endpoint determine?

   a. 17
   b. 20
   c. 45
   d. 55
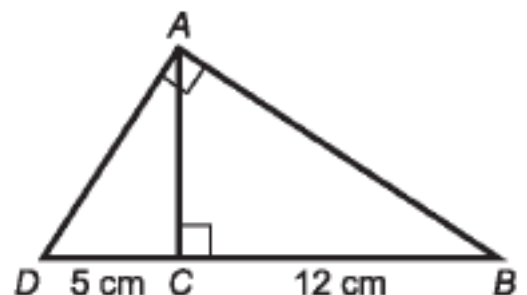
4. In rectangle PRST, $\overline{QT} \perp \overline{SQ}$ Given that all of the triangles are similar which statement is correct?

   a. $\triangle QTS \sim \triangle PQT$
   b. $\triangle QTS \sim \triangle RQS$
   c. $\triangle PQT \sim \triangle SQR$
   d. $\triangle PQT \sim \triangle RQS$

5. In the right triangle $\triangle DAB$, $\overline{AC}$ is an altitude. What is AC, in centimeters?

   a. 7
   b. $2\sqrt{15}$
   c. 13
   d. $6\sqrt{10}$

6. What is the value of the expression $1 + \frac{1}{x} + \frac{x}{x^2} + \frac{x^2}{x^3}$ for x = -4

   a. $\frac{1}{4}$

   b. $\frac{19}{24}$

   c. $1\frac{1}{12}$

   d. $1\frac{3}{4}$

7. Evaluate this expression for $x = \frac{1}{2}$ and $y = \frac{1}{3}$
   $x^2 y - (x^2 - y^2) + xy^2$

   a. 0

   b. $\frac{1}{23}$

   c. $\frac{2}{35}$

   d. $\frac{2}{9}$

8. What is the product of $x + 2y + z$ and $2z^2 + 1$
   a. $x + 2y + 2z^3 + 1$
   b. $2xz^2 + 4yz^2 + 2z^3 + 1$
   c. $2xz^2 + 4yz^2 + 2z^3 + x + 2y + z$
   d. $2xz^2 + 4yz^2 + 2z^2 + x + 2y + z$

9. When a student subtracts 18 from a number, the result is ¼ of the number. What is the number?

   a. 6
   b. 18
   c. 24
   d. 36

10. At a sawmill, the circumference of the base of a con-shaped pile of sawdust is 50ft. The cone rises at an angle of 40° . To the nearest tenth of a foot, how tall is the pole of sawdust? (Note π =3.14)

   a. 5.1
   b. 6.1
   c. 6.7
   d. 9.5

Sample Questions

Below are 10 sample multiple choice questions from the ACT International Subject Test: Math II

1. Hunter's Transport Company has 7 dump trucks, 5 cement trucks, and 9 drivers. Dump trucks haul 6 tons, while cement trucks haul 10 tons. The company has a contract to transport 360 tons of gravel and cement per day to a road construction site. The dump trucks can make 8 trips a day, while the cement trucks can make 6 trips a day. A dump truck costs \$30 per day, and a cement truck costs \$42 per day. If all 9 drivers work on this job, using how many trucks of each type will minimize the cost?

   a. 4 dump and 5 cement trucks
   b. 5 dump and 4 cement trucks
   c. 6 dump and 3 cement trucks
   d. 7 dump and 2 cement trucks

2. What is the area of the figure determined by this system of inequalities?

   $$\left[\begin{array}{l} -4 \le x \le 0 \\ -6 \le y \le 0 \end{array} \right.$$

   a. 6
   b. 15
   c. 24
   d. 2

3. For the equation $x^2 - 4x + 4 = 9$, determine the discriminant

   a. -36
   b. 0
   c. 6
   d. 36

4. If $c - d = 7$ and $c = 3-4i$, what is d?
   a. $-4-4i$
   b. $-4+4i$
   c. $4-4i$
   d. $4+4i$

5. What is the value of $\left[8\left(\cos \frac{\pi}{2} + i \sin \frac{\pi}{2} \right) \right]^{\frac{x}{3}}$?
   a. $1+i\sqrt{3}$
   b. $2(1+i\sqrt{3})$
   c. $2(\sqrt{3}+i)$
   d. $4(1+i\sqrt{3})$

6. Which expression is equivalent to:
   $\frac{\cos\theta + \cos^2\theta}{\sin\theta - \sin\theta\cos\theta}$?

   a. $\cot\theta \cot^2 \frac{\theta}{2}$
   b. $\tan\theta \tan^2 \frac{\theta}{2}$
   c. $\cot\theta \cos^2 2\theta$
   d. $\tan\theta \tan^2 2\theta$

7. Which function has an x-intercept at (-1, 0) and a horizontal asymptote of $y = -\frac{3}{2}$?

   a. $\frac{3x^2 - 7x + 1}{2x^2 + 2}$

   b. $\frac{6x^2 - 7x + 1}{-4x^2 + 2}$

   c. $\frac{12x^2 - 13x + 1}{-8x^2 + 3}$

   d. $\frac{15x^2 + 16x + 1}{-2x^2 + 7}$

8. Evaluate $\sum_{n=1}^{\infty} \frac{1}{2}(-3)^{-n}$

   a. $-\frac{1}{4}$

   b. $-\frac{1}{8}$

   c. $\frac{1}{8}$

   d. $\frac{3}{4}$

9. Which equation has a graph which is symmetric with respect to the origin?

   a. $y = |x|$
   b. $y = x^3 - 2x$
   c. $y = \frac{4}{x^2}$
   d. $y = -3x^4$

10. Simplify $\log_b a^3 - \log_b a^2$

    a. $\log_b a$
    b. $\log_b a^5$
    c. $\log_b a^6$
    d. $\log_b a^{3/2}$