

HOSA

Academic Testing Center

Allied Health Statistics
Anatomy and Physiology
Biochemistry
Biology
Career Development
Environmental Health

General Chemistry
Human Heredity
Math for Health Professionals
Microbiology
Organic Chemistry
Physics College

Eligible Divisions: Secondary, Postsecondary / Collegiate, and Alumni	Round 1: 50 Q test in 60 minutes	Digital Upload: NO
Solo Event: 1 competitor		



New for 2024 – 2025

Test plans have been updated. Environmental Health test has been added. A copy of the periodic table of elements will be provided for those taking the Biochemistry, Organic Chemistry, and General Chemistry tests. A new resource has been added to the Career Development Test. At ILC, dress code bonus points are not awarded.

Event Summary

The goal of the HOSA Academic Testing Center is to provide as many International Leadership Conference HOSA delegates as space permits with the opportunity to demonstrate their basic knowledge in preparation to become future health professionals.

The series of events in the HOSA ATC are written tests based on items from the identified text specific to each event. Competitors will recognize, identify, define, interpret, and apply knowledge in a 50-item multiple choice test with a tie-breaker question. The written test will measure knowledge and understanding at the recall, application, and analysis levels. Higher-order thinking skills will be incorporated.

Dress Code

Bonus points are NOT awarded for [proper dress](#) in ATC events, but competitors are still encouraged to dress professionally.

Competitors Must Provide

- [Photo ID](#)
- Two #2 lead pencils (not mechanical) with eraser

General Rules

1. Competitors must be familiar with and adhere to the [General Rules and Regulations](#).
2. A tie-breaker question(s) will be administered with the original test. In case of a tie, the tie-breaker question(s) will be judged and used to break the tie.

3. All competitors shall report to the site of the event at the time designated for the test in ILC publications. Competitors will bring a [photo ID](#) as well as two #2 lead pencils (not mechanical) for test-taking.
4. [Test Instructions](#): The competitors will be given instructions and will be notified to start the test. There will be a maximum of 60 minutes to complete the test.
5. **TIME REMAINING ANNOUNCEMENTS**: There will be NO verbal announcements for time remaining during ILC testing. All ILC testing will be completed in the Testing Center and competitors are responsible for monitoring their own time.
6. **Calculators**: At the International Leadership Conference, HOSA will provide [basic](#) handheld calculators (no graphing calculators) for addition, subtraction, division, multiplication and square root calculations for the following ATC tests: Allied Health Statistics, Math for Health Professionals, Anatomy & Physiology, Biochemistry, General Chemistry, Organic Chemistry, & Physics.
7. **Periodic Table**: At the International Leadership Conference, HOSA will provide the periodic table of elements for the following tests: Biochemistry, Organic Chemistry, and General Chemistry.

Testing Areas and Resources

8. The twelve (12) approved tests for ILC and their associated resources used in the development of the test questions are as follows:

Event	Resource Title	ISBN
1. Allied Health Statistics	Basic Allied Health Statistics and Analysis, 5th Edition	9781337796965
2. Anatomy and Physiology	Body Structures and Functions, 14th edition.	9780357457542
3. Biochemistry	Introduction to General, Organic and Biochemistry, 12th edition	9781337571357
4. Biology	Biology: The Unity and Diversity of Life, 15th AP Edition	97813374085925.
5. Environmental Health	Environmental Science: 17th Edition	9780357976319
6. Career Development	Your Career: How to Make it Happen 10th edition Career Success in Health Care 4th edition	9780357711460 9781285866888
7. General Chemistry	A Comprehensive Approach Chemistry AP Edition, 10th edition	9781305957732
8. Human Heredity	Human Heredity: Principles and Issues, 11th edition	9781305251052
9. Math for Health Professionals	Math for Health Professionals, 2nd edition	9781305509788
10. Microbiology	Microbiology: Practical Applications and Infection Prevention, 1st Edition	978113369642

11. Organic Chemistry	Introduction to General, Organic and Biochemistry, 12th edition	9781337571357
12. Physics College	College Physics AP Edition, 11th	9781305965393

9. Test Plans:

Allied Health Statistics:

- Identify the importance of health statistics and health data across the continuum - 20%
- Understand statistics related to census, occupancy, and length of stay in hospitals - 24%
- Understand hospital obstetric and neonatal statistics - 8%
- Identify clinical and non-clinical statistics - 8%
- Understand terms and rates related to mortality and autopsy - 8%
- Understand community health statistics - 8%
- Understand the basics of math, statistics and organization of data for analysis - 16%
- Understand the fundamentals of research - 8%

Anatomy & Physiology:

- Describe the physiology of the human body - 40%
- Identify the anatomy of the human body - 40%
- Identify common diseases and disorders of the human body - 20%

Biology:

- Describe the study of life and levels of organization - 10%
- Describe the structures and functions of plant and animal cells - 20%
- Describe the mechanisms of genetics and heredity - 20%
- Apply the principles of evolution - 10%
- Describe evolution and biodiversity - 10%
- Identify structures and functions of plant and animal systems - 20%
- Describe the principles of ecology - 10%

Biochemistry:

- Understand the characteristics of water - 10%
- Describe the structure and functions of proteins, including amino acids, peptides, and enzymes - 20%
- Identify the structures and functions of carbohydrates - 20%
- Understand nucleic acids (DNA and RNA) and the role in genetics - 20%
- Describe the structure and functions of lipids - 10%
- Understand biological membranes and their role in cell transport - 6%
- Explain metabolism and how ATP is produced - 14%

Career Development:

- Recognize how to begin the process of career development - 10%
- Identify the required skills needed for career development - 12%
- Describe individual preferences for career development - 8%
- Identify values needed for career development - 8%
- Understand the exploration stage of career development - 10%
- Describe the relationships required for career development - 10%

- Identify the stages of the decision making - 14%
- Determine the tools required for career development - 6%
- Understand the launch stage of career development - 16%
- Recognize the skills required for career management - 6%

Environmental Health:

- Sustaining Resources and Environmental Quality- 10%
- Natural Resources - 10%
- Environmental Pollution - 10%
- Climate Change - 10%
- Sustainable Development - 10%
- Human Population and Environment - 10%
- Environmental Laws and Policies - 10%
- Environmental Health and Toxicology - 10%
- Environmental Hazards and Human Health 10%
- Global Environmental Issues - 10%

General Chemistry:

- Describe chemistry concepts, measurements, and calculations of moles, molar mass, and energy - 20%
- Identify elements, atoms, ions, and periodicity - 10%
- Describe chemical reactions, energy, and solutions - 30%
- Identify chemical composition, quantities, kinetics, & equilibrium - 10%
- Understand general concepts of bonding - 4%
- Identify modern atomic theory - 4%
- Compare and contrast acids and bases - 4%
- Understand principles of chemical nomenclature - 4%
- Identify the properties of matter, including solids, liquids, and gasses - 10%
- Understand electrochemistry and entropy - 4%

Human Heredity:

- Identify common genetic diseases and disorders, including cancer - 24%
- Understand chromosomes, inheritance, and the transmission of traits - 10%
- Explain Punnett squares, pedigrees, karyotypes and the inheritance of complex traits - 14%
- Explain how the immune system and viruses affect genes - 2%
- Explain phenotypes, gene expression and gene regulation - 8%
- Describe how mutations and epigenetics affects genes - 8%
- Describe genetic technologies, genomes, biotechnology, reproductive technology, genetic testing and gene therapy - 12%
- Describe the role of genetics, DNA, RNA, and chromosomes, and protein synthesis - 12%
- Understand the process of cell division (meiosis), DNA mutations, and chromosome mutations - 10%

Math for Health Professionals:

- Understand how to create the proper solution - 20%
- Understand basic mathematical concepts and conversions - 22%
- Understand how to determine proper drug dosages - 30%
- Understand how to measure input and output - 4%
- Identify how to convert roman numerals - 2%
- Identify how to determine drops per minute and flow rate - 10%
- Identify how to convert from the metric system to the English system and vice versa - 10%

- Understand basic medical terminology - 2%

Microbiology:

- Identify the different types of sanitation, sterilization, and disinfection - 8%
- Identify infectious diseases and disorders - 26%
- Understand infection control, the chain of infection & pathogens transmission - 14%
- Identify healthcare associated infections - 6%
- Understand the history of microbiology - 4%
- Describe the types of immunity, immunizations, & antimicrobials - 10%
- Identify tests that can be used to determine infection - 4%
- Understand asexual reproduction - 2%
- Identify the characteristics of mold - 4%
- Understand classifications of organisms - 6%
- Identify characteristics of prokaryotic cells, including bacteria - 8%
- Describe the different types of stains used in microbiology - 6%
- Understand the pH scale and effect on microorganisms - 2%

Organic Chemistry:

- Describe electronegativity – structure and bonding - 16%
- Describe chemical bonds, shapes and naming of compounds- 16%
- Describe stereochemistry - 4%
- Describe substitution and elimination reactions - 6%
- Identify aromatic compounds and IUPAC names - 12%
- Differentiate and describe alkanes, alkenes, alkynes, cycloalkanes, alcohols, ethers, epoxides, sulfides, aldehydes, ketones, and functional groups - 26%
- Identify carboxylic acids and derivatives - 8%
- Understanding how to name amines - 8%
- Describe spectroscopy - 4%

Physics:

- Understand work, energy and particle dynamics (velocity, acceleration, force, heat, friction, motion) - 10%
- Understand concepts of waves & sound and laws of thermodynamics - 10%
- Understand the principles of fluid mechanics including buoyancy - 4%
- Understand the principles of electricity, including current, watts, amp resistance, electrical charges, electrical circuits and electric fields - 20%
- Compare and contrasts properties of light, waves and particle model - 12%
- Describe optics, images and focal points - 4%
- Describe the laws of thermodynamics - 10%
- Understand the concept of magnetism and inductance - 10%
- Understand basic mathematical concepts related to physics - 20%

Registration Priority and Process

10. **ILC registration** includes the opportunity to take one HOSA Academic Testing Center test. Delegates who wish to take additional HOSA Academic Testing Center tests may do so by paying \$20 per additional test. There is no maximum limit to the number of HOSA ATC tests that can be taken at ILC, as long as the competitor can logistically sit to test in all events for which they are registered.

11. Delegates will pre-register for the HOSA Academic Testing Center at ILC in the HOSA Conference Management System. No walk-up HOSA ATC registration is allowed at ILC, only registered delegates by the published ILC deadline will be allowed to test.
12. Competitors should refer to the [General Rules and Regulations](#) for information on how many competitive events they can register for at ILC.
13. At State Chartered Association Conferences, these eleven (12) tests MAY be available as an additional event opportunity. Please check with your state HOSA leadership for details.

Recognition and Awards

14. A Certificate of Participation is given to every delegate who takes a test in the HOSA Academic Testing Center.
15. The Top Ten HOSA members in EACH EVENT (not by division) will be recognized on stage at the Grand Awards Ceremony, with 1st, 2nd and 3rd place receiving special recognition.

Sample Test Questions

The remaining pages of these guidelines include sample test questions from each of the eleven event tests.

Allied Health Statistics

1. Which of the following facilities delivers the highest level of nursing care?
 - a. Intermediate Care
 - b. **Residential Care**
 - c. Skilled Nursing Care
 - d. Rehabilitation Care
2. Which type of validity refers to how well the study adheres to accepted and established standards?
 - a. Face validity
 - b. Content validity
 - c. **Construct validity**
 - d. Criterion validity
3. Where do low numbers appear in a frequency polygon?
 - a. Bottom and to the right
 - b. Bottom and to the left
 - c. Top and to the right
 - d. **Top and to the left**

Anatomy and Physiology

1. Health care workers use a spirometer to measure the_____.
 - a. level of carbon dioxide in the blood
 - b. **lungs' capacity for air**
 - c. amount of pressure in the lungs
 - d. level of pleural fluid
2. What causes plasma-like fluid to flow from the blood in the glomerulus into Bowman's capsule?
 - a. Increase in blood pressure in the capillaries
 - b. **Hormonal secretions**

- c. Stimulation from the nerves
 - d. Level of salt in the blood
3. Which of the following is the definition of a fomite?
- a. Bacterial infection transmitted through contaminated water
 - b. Small worm that may be present in meat and which infects the intestinal tract.
 - c. Person who experiences no symptoms but can transmit an infection.
 - d. **Non Living object that is contaminated with an infectious agent**

Biochemistry

1. Which of the following compounds would have the highest boiling point?
- a. $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$
 - b. CH_3NH_2
 - c. CH_3OH
 - d. **CH_2F_2**
2. Which subatomic particle is found in all isotopes of hydrogen?
- a. **Proton**
 - b. Neutron
 - c. Electron
 - d. Positron
3. $\text{CH}_3\text{C} \equiv \text{CCH}_2\text{CH}_2\text{Cl}$ is named:
- a. 1-chloro-3-pentyne
 - b. 5-chloro-2-pentene
 - c. 1-acetylenyl-3-chloropropane
 - d. **5-chloro-2-pentyne**

Biology

1. In the electromagnetic spectrum,_____.
- a. infrared energy has the shortest wavelength
 - b. infrared radiation has more energy than red radiation
 - c. **visible light provides the energy for photosynthesis**
 - d. near-infrared radiation provides the energy for photosynthesis
2. In order for DNA molecules to undergo recombination,_____.
- a. they must be from the same species
 - b. their strands must separate as in replication
 - c. **they must be cut and spliced at specific nucleotide sequences**
 - d. one of the two DNA strands must be degraded
3. In garden peas, one pair of alleles controls the height of the plant, and a second pair of alleles controls flower color. The allele for tall (*D*) is dominant to the allele for dwarf (*d*), and the allele for purple (*P*) is dominant to the allele for white (*p*). A tall plant with purple flowers crossed with a tall plant with white flowers produces 3/8 tall purple, 1/8 tall white, 3/8 dwarf purple, and 1/8 dwarf white. What is the genotype of the parents?
- a. **Dd Pp x Dd pp**
 - b. Dd Pp x Dd Pp
 - c. DD Pp x dd Pp
 - d. Dd pp x dd Pp

Career Development

1. If a physician fails to use a degree of skill and learning commonly expected and the person receiving care is injured, the physician can be sued for _____.
 - a. Negligence
 - b. Defamation
 - c. **Malpractice**
 - d. Assault and battery
2. Patients confined to bed should have their position changed at least every _____.
 - a. 30 minutes
 - b. Hour
 - c. **2 hours**
 - d. 3 hours
3. $5/8 + 3/12 =$
 - a. $11/12$
 - b. $13/16$
 - c. $8/24$
 - d. $7/8$

Environment Health

1. What is the primary cause of ocean acidification?
 - a. overfishing in marine environments
 - b. increased volcanic activity
 - c. excessive plastic pollution
 - d. **absorption of carbon dioxide from the atmosphere**
2. What is the main driver of global climate change?
 - a. increased levels of oxygen in the atmosphere
 - b. expansion of agricultural land
 - c. **burning of fossil fuels**
 - d. natural variations in the Earth's orbit
3. Which environmental issue is directly caused by the accumulation of excess nutrients in water bodies?
 - a. ozone depletion
 - b. **eutrophication**
 - c. deforestation
 - d. desertification

General Chemistry

1. Select the correct molecular structure for CO_2 :
 - a. **linear**
 - b. trigonal planar
 - c. tetrahedral
 - d. bent
2. Consider the molecular orbital description of the NO^- anion. Which of the following statements is false?
 - a. NO^- is paramagnetic.
 - b. **NO^- is isoelectronic with CO.**
 - c. The bond energy in NO^+ is greater than the bond energy in NO^- .
 - d. The bond order in NO^- is 2.
3. For which of the following compound(s) are *cis* and *trans* isomers possible?
 - a. **2,3-dimethyl-2-butene**

- b. 3-methyl-2-pentene
- c. 4,4-dimethylcyclohexanol
- d. *ortho*chlorotoluene

Human Heredity

1. The letters G, Q, R, and C, used to describe the appearance of chromosomes, refer to the ____.
 - a. position of the bands
 - b. **staining procedure used to reveal the bands**
 - c. number of arms per chromosome
 - d. number of centromeres per chromosome
2. Which of the following sequences indicates the promoter region of a gene?
 - a. **CAAT**
 - b. UAAG
 - c. CTTT
 - d. ACAT
3. The ability to taste PTC and other bitter chemicals is controlled by _____.
 - a. hormone levels that change throughout life
 - b. **proteins on the surface of receptor cells**
 - c. the amount of PTC exposure as a child
 - d. the amount of capsaicin present in taste buds

Math for Health Professionals

1. Goniometers measure
 - a. **range of motion**
 - b. weight
 - c. surface area
 - d. Time
2. The hospital uses a 15-drop-per-mL drip set. How will you adjust the IV to infuse 250 mL over 3 hours?
 - a. constant infusion
 - b. every minute
 - c. every 30 seconds
 - d. **every 3 seconds**
3. Calculate the BMI for Weight: 165 pounds; Height: 73 inches.
 - a. 30
 - b. 25
 - c. 18
 - d. **22**

Microbiology

1. By what mechanism does a virus cause disease?
 - a. by infecting the nervous system in humans
 - b. **by shutting down or destroying a cell**
 - c. by living on or in another organism
 - d. by infecting red blood cells
2. Toxic proteins that can be secreted outside of the cell are called?
 - a. bactericides

- b. endotoxins
 - c. **exotoxins**
 - d. aspergillus
3. Which main class of disease-causing parasites contain tapeworms?
- a. **Helminths**
 - b. protozoa
 - c. ectoparasites
 - d. Ergosterol

Organic Chemistry

1. Name the following: $\text{CH}_3 - \text{CH}_2 - \text{CH}_3$
- a. ethane
 - b. **propane**
 - c. butane
 - d. Pentane
2. $\text{CH}_3\text{C} \equiv \text{CCH}_2\text{CH}_2\text{Cl}$ is named:
- a. 1-chloro-3-pentyne
 - b. 5-chloro-2-pentene
 - c. 1-acetylenyl-3-chloropropane
 - d. **5-chloro-2-pentyne**
3. What is the correct (IUPAC) name of the following molecule: 2-methyl-4-t-butylpentane
- a. 2-t-butyl-4-methylpentane
 - b. **2,2,3,5-tetramethylhexane**
 - c. 2,4,5,5-tetramethylhexane
 - d. 1-sec-butyl-1,2,2-trimethylpentane

Physics College

1. How many moles of air must escape from a 15.0-m \times 9.0-m \times 6.0-m room when the temperature is raised from 10.0°C to 20.0°C? Assume the pressure remains unchanged at one atmosphere while the room is heated. ($R = 8.31 \text{ J/mol}\cdot\text{K}$)
- a. 4.9E+3 moles
 - b. **1.2E+3 moles**
 - c. 2.2E+2 moles
 - d. 7.9E+2 moles
2. A loop of area 0.384 m² is in a uniform 0.0565-T magnetic field. If the flux through the loop is $6.10 \times 10^{-3} \text{ T}\cdot\text{m}^2$, what angle does the normal to the plane of the loop make with the direction of the magnetic field?
- a. 73.7°
 - b. 89.3°
 - c. **16.3°**
 - d. 76.0°
3. The escape speed from the surface of the Earth is 11.2 km/s. Estimate the escape speed for a spacecraft from the surface of the Moon. The Moon has a mass 1/81 that of Earth and a radius 0.25 that of Earth.
- a. **2.5 km/s**
 - b. 4.0 km/s
 - c. 5.6 km/s
 - d. 8.7 km/s