BeST Science Times

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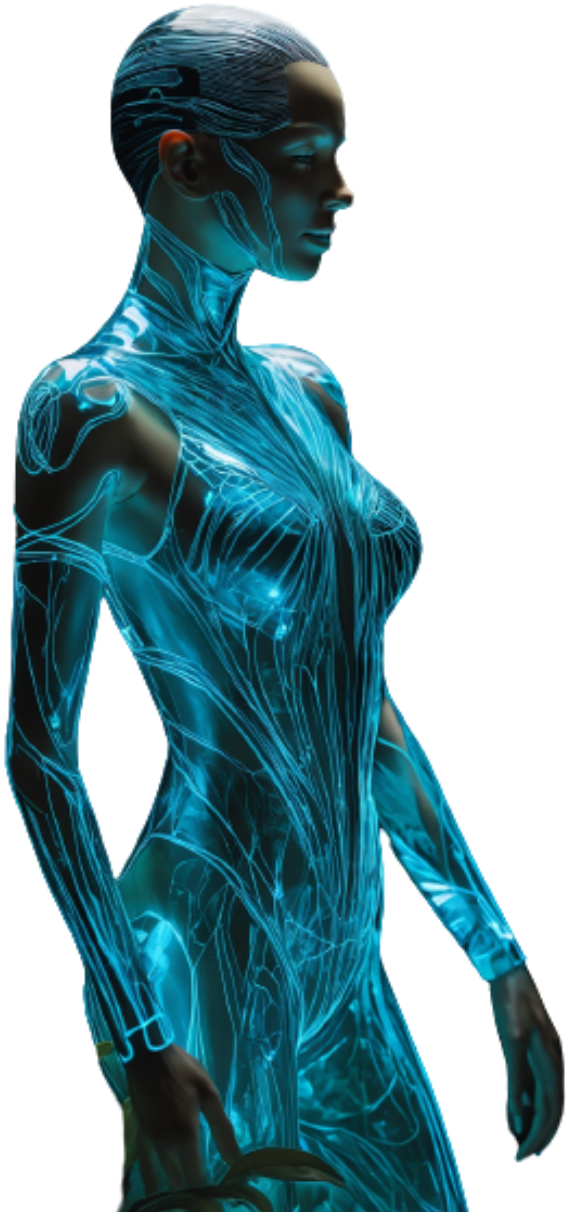
VITAL VANGUARD

Navigating the Frontier of Diseases, Immunology, and Epidemiology



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FOREWORD

Written By: Lawrence Kim

It is of great pleasure that I have the opportunity to collaborate with my innovative peers and release a newspaper under the name of “BeST Science Times Newspaper and Research Club”. Consistently, our club is dedicated to enhancing our projects and establishing new standards. With each endeavor, we strive for improvement, and I am confident that, over time, our newspaper will also experience significant growth.

To give you a background about myself, I am currently a sophomore at the BST Academy pursuing the Biomedical pathway. Moreover, I am the founder/president of the BeST Science Times Newspaper & Research Club, as well as the president of the BST Ambassadors.

Throughout my time here in BST, I have embarked on numerous endeavors regarding science and discovered the underlying layers of our lives. From simple wonders of whether my laughter can be contagious to exploring the complexities of the human body, science truly has the capacity to open up new worlds for all. However, it was evident that most youth are not exposed to an adequate amount of material regarding science, since I, along with most of my peers, have had little to no interaction with science until we started attending the BST Academy.

Therefore, I established the BeST Science Times Club to expose all students to the wonders of science, through a student-run student-written science newspaper.

I would like to thank the BeST Science Times Club members, our assistant principal Ms. Davis, our advisor Ms. Parker, and all BST faculty and students for this amazing opportunity to express our interests in the wonders of science.

TEACHER SECTION: THE IMMUNE SYSTEM

Written By: Ms. Dejah Parker

BeST Science Times Club Advisor

The immune system is a complex network of organs that work to protect us from diseases, and the field of immunology works to uncover exactly how that process works. According to the British Society for Immunology, immunology is the study of the immune system, a complex network of cells and proteins that defend the body against infections and diseases. The immune system can recognize and eliminate harmful pathogens, such as bacteria and viruses, through various mechanisms. Disorders of the immune system can lead to immunodeficiency or autoimmunity, where the immune system attacks the body's own cells. Understanding immunology is crucial for developing vaccines and treatments for infectious diseases and autoimmune conditions.

Ongoing research continually enhances our knowledge of immunology, contributing to advancements in medical science. Researchers such as those at the Mayo Clinic, a medical institution that is top-ranked in the nation for their quality health care and research, study a wide range of diseases to determine how exactly our immune system responds when these diseases are interfering. Through interactive treatment and research, these faculty members in the Department of Immunology are able to perform diagnostics to be able to foster discovery and increased knowledge relating to allergies, cancer, infections, and other disease-specific problems. While there is more to be discovered in the area of diseases and how they relate to immunology, researchers continue to find solutions that aid in keeping humans healthy through treatment and prevention.

SYNERGIES OF BIOTECHNOLOGY AND EPIDEMIOLOGY

Written By: Rohan Alam

Sophomore at BST Academy

In recent years, medical technology has been at an all time high, specifically biotechnology. Biotechnology is the integration of using or solving biological processes with technology. Advances in knowledge and technology alone have posed a numerous number of benefits for today's problems regarding epidemiology. Epidemiology is a branch of medicine that encompasses the processes and control of diseases, as well as other issues in regard to the health of our society. Biotechnology has been exceptionally helpful in epidemiological issues, such as the COVID-19 virus, forensic sciences, and pharmaceutical manufacturing.

As you may already know, the COVID-19 virus that struck the Earth in late 2019 left a drastic footprint on our society and environment. When the virus first appeared, there was no cure and anyone who acquired the disease would not generally have long to live. This created a major problem and the only way to solve it would be with a type of vaccine. The search for this vaccine would only be created through biotechnology. Biotechnicians and scientists analyzed patients contaminated with the disease using Nucleic Acid Tests (NAT). These tests detected the DNA broken within the patient to better understand what genomes are being affected, which would then allow for the implementation of biotechnology to prevent those genomes from getting attacked. Scientists were able to find the SARS-CoV-2 virus attacking the host. SARS-CoV-2 stands for severe acute respiratory syndrome coronavirus 2. This is what ultimately led to the discovery of the Covid-19 vaccine, also known as an mRNA vaccine.

SYNERGIES OF BIOTECHNOLOGY AND EPIDEMIOLOGY

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The mRNA vaccine would initially use lipids as envelopes to deliver information to the cells of the body without Coronavirus, which are known as “Spike Proteins.” In addition, the vaccine would introduce that mRNA to a viral protein (SARS-CoV-2), producing an immune response to activate antibodies. These antibodies would then fight pathogens off to maintain homeostasis in your body, ultimately ridding the SARS-CoV-2 virus. Without the use of biotechnology, there would never have been a cure to Covid-19.

Another crucial benefit of biotechnology would be in forensic sciences. Forensics is known as the inclusion of sciences in the legal setting. Some ways which biotechnology can be used in forensics is when identifying and tracing evidence from a crime scene, such as hair, skin, or even blood. Biotechnology that can be used in this field would be DNA profiling and genetic fingerprinting. By understanding the biology of these sequences, evidence like hair or blood that contains DNA would allow forensic scientists and detectives to understand the origin. One significant example of biotechnology that aids forensic scientists is through a PCR (Polymerase Chain Reaction) machine. This machine amplifies DNA by making millions of copies of the same sequence, allowing for DNA fingerprinting to be possible even with minimal amounts of DNA. Additionally, there are two different types of variable sequences that are present in the human genome: VNTR (Variable Number TandemRepeats) and STR (Short Tandem Repeats). When the results of these two observations are combined, the ability to determine the profile of a person is much more probable.

SYNERGIES OF BIOTECHNOLOGY AND EPIDEMIOLOGY

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Sophomore at BST Academy

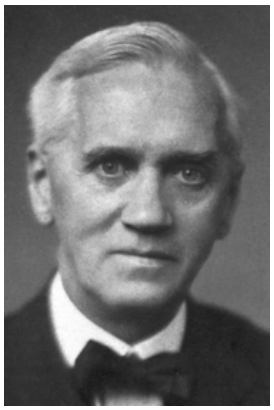
Lastly, the impacts of biotechnology and the pharmaceutical industry has been sporadic. In today's day and age, biotechnology is much more complex than it once was. It now includes various different types of techniques that are used in drug development. Some examples are DNA sequencing and gene cloning. DNA sequencing allows for the understanding of what genetic variation may affect drug metabolism. It can also reveal the mechanisms of a disease and how it works, as a way to counteract it early as a patient is being treated. Gene cloning can be used for drug manufacturing through stem cells. A stem cell is a cell with no designated differentiation. In more simple terms, it is a cell that has no job. These stem cells can be used in experiments where they are aimed at a disease for better understanding and to create new treatments. If biotechnology such as DNA sequencing and gene cloning were not available, then disease would spread with no possible cure at all.

Biotechnology and its recent association with epidemiological issues such as Covid-19 vaccines, forensic sciences, and pharmaceutical manufacturing, has allowed for greater benefits in the world we know today. The numerous different biotechnologies have marked a medical revolution in the twenty-first century. They have allowed for scientists to embark on acquiring treatments for diseases that were once thought to be impossible. The medical industry and entirety of the world would not succeed and progress this far in the absence of biotechnology.

NOBEL PRIZE WINNERS IN DISEASES AND IMMUNOLOGY

Written By: Elijah Abdelsayed

Freshman at BST Academy



Sir Alexander Fleming

Sir Ernst Boris Chain

Sir Howard Walter Florey

Sir Alexander Fleming, Sir Ernst Boris Chain, and Sir Howard Walter Florey received a Nobel Prize in Psychology/Medicine in 1945 for their revolutionary discovery and development of the drug Penicillin.

In 1920, Sir Alexander Fleming left his laboratory window open with some Petri dishes on the windowsill. When he came back from a vacation, he noticed that some mold that had grown around the Petri dish was keeping some bacteria from growing. He would soon find out that the mold, called Penicillin, “produced a self-defense chemical that could kill bacteria.”

Following the discovery of Penicillin, Sir Ernst Boris Chain, a British biochemist, and Sir Howard Walter Florey, an Australian pathologist, successfully developed Penicillin into a drug that could treat bacterial infections.

NOBEL PRIZE WINNERS IN DISEASES & IMMUNOLOGY

Written By: Elijah Abdelsayed

Freshman at BST Academy

Ardem Patapoutian

David Julius

David Julius and Ardem Patapoutian received a Nobel Prize in Psychology/Medicine in 2021 for their discoveries of receptors for temperature and touch.

Julius, an American physiologist, and Patapoutian, a Lebanese American molecular biologist, discovered temperature receptors through three unrelated findings: a better understanding of pain-sensing, the molecular nature of channels in charge of touch, and proprioception (sixth sense).

One of these discoveries that David Julius discovered was through using both chili peppers and peppermint to identify which receptors detect the temperature and pain of these two food items. Through numerous discoveries like temperature receptor types, Julius and Patapoutian identified the gene that reacts to capsaicin, a compound in chili peppers that trigger pain within our cells.

NOBEL PRIZE WINNERS IN DISEASES & IMMUNOLOGY

Written By: Elijah Abdelsayed

Freshman at BST Academy

Katalin Karikó

Drew Weissman

Katalin Karikó and Drew Weissman won a Nobel Prize in Psychology/Medicine in 2023 for their discoveries concerning base modifications that enabled the development of effective mRNA vaccines against COVID-19.

Karikó, a Hungarian American biochemist, and Weissman, a, American physician and immunologist, discovered the dendritic cells active and release inflammatory signaling molecules when they recognize transcribed mRNA as a foreign substance.

After meeting each other thirty years ago while photocopying papers for their research, they began many experiments to discover whether or not mRNA could be used as a potential therapeutic in order to go into the immune system and kill a virus. They used this mRNA to target COVID-19 in the body and thus created an effective vaccine against the virus.

LEADING COLLEGES SPECIALIZING IN DISEASES AND IMMUNOLOGY

Written By: Michael Espique

Sophomore at BST Academy

Epidemiology, the study of the patterns, causes, and effects of diseases in populations, plays a crucial role in public health. As the world faces many global health challenges, there is a pressing need for well-trained epidemiologists. Several colleges and universities have established themselves as leaders in epidemiology, offering specialized programs and resources to prepare students for impactful careers in public health. This article will provide an overview of the programs and expertise of some of the top institutions for epidemiology education.

Harvard University:
Harvard's T.H. Chan School of Public Health is renowned for its epidemiology program. With an emphasis on research, students have the opportunity to work on groundbreaking studies. The school's resources and network provide a platform for global health initiatives.

Johns Hopkins University:
The Johns Hopkins' Bloomberg School of Public Health is consistently ranked among the best in epidemiology. The school's expertise in infectious disease epidemiology is world-class. Students benefit from access to cutting-edge research and a vast network of alumni working in the field.

LEADING COLLEGES SPECIALIZING IN EPIDEMIOLOGY

Written By: Michael Espique

Sophomore at BST Academy

University of North Carolina at Chapel Hill:
UNC's Gillings School of Global Public Health offers a comprehensive epidemiology program. Their strengths lie in the study of chronic diseases, environmental health, and maternal and child health. Students can engage in interdisciplinary research to address complex public health issues.

Columbia University:
The Mailman School of Public Health at Columbia excels in epidemiology and biostatistics. With New York City as a backdrop, students have access to diverse public health challenges and resources. The school's faculty includes renowned epidemiologists.

University of California, Berkeley:
UC Berkeley's School of Public Health is known for its strong epidemiology program. Students can delve into various areas such as infectious diseases, cancer epidemiology, and environmental health. The school's location in the heart of the San Francisco Bay Area offers unique opportunities for research.

Emory University:
Emory's Rollins School of Public Health boasts a well-regarded epidemiology department. The school's focus on global health issues, including disease outbreaks and humanitarian crises, provides students with a unique perspective on public health challenges.

LEADING COLLEGES SPECIALIZING IN EPIDEMIOLOGY

Written By: Michael Espique

Sophomore at BST Academy

Yale University:
Yale School of Public Health offers a wide range of epidemiology programs, emphasizing the importance of social determinants of health. Students can engage in research that explores the societal factors influencing disease transmission and outcomes.

University of Michigan:
The University of Michigan School of Public Health is known for its strong commitment to public health research and practice. Epidemiology students can collaborate with faculty on various public health studies and projects.

These institutions offer a diverse array of epidemiology programs, each with its own unique strengths. Whether your interests lie in infectious diseases, chronic conditions, environmental health, or global health challenges, these colleges provide the academic excellence and resources needed to make a meaningful impact in the field of epidemiology. Below are their websites if you are interested!

Harvard's T.H. Chan School of Pub. Health: hsph.harvard.edu
Johns Hopkins Bloomberg School of Pub. Health: publichealth.jhu.edu
UNC Gillings School of Global Pub. Health: sph.unc.edu
Columbia Mailman School of Pub. Health: publichealth.columbia.edu
UC Berkeley School of Pub. Health: publichealth.berkeley.edu
Emory Rollins School of Pub. Health: sph.emory.edu
Yale School of Public Health: ysph.yale.edu
UMichigan School of Pub. Health: sph.umich.edu

REVOLUTIONARY SCIENTIFIC DISCOVERIES OF THE 20TH CENTURY: SOUTHERN SPAIN

Written By: Oliver Chen

Sophomore at BST Academy

The analysis of the epidemiological issues within South Spain was brought to the attention of Alvarez-Galvez et al., professors from the University of Cadiz. They've observed that the main factor of Southern Spain's epidemiological issues is multimorbidity, a phenomenon where several chronic diseases affect one another at the same time. In order to mitigate the risks of multimorbidity, Galvez et al. conducted this study to figure out the root issues as well as the reoccurring geographical patterns. Within their study, they identified the main issues/disorders taking place, starting from most common to least: Cardiovascular, Musculoskeletal, Mental Respiratory, Complex, Cancer, Metabolic and Neurologic.

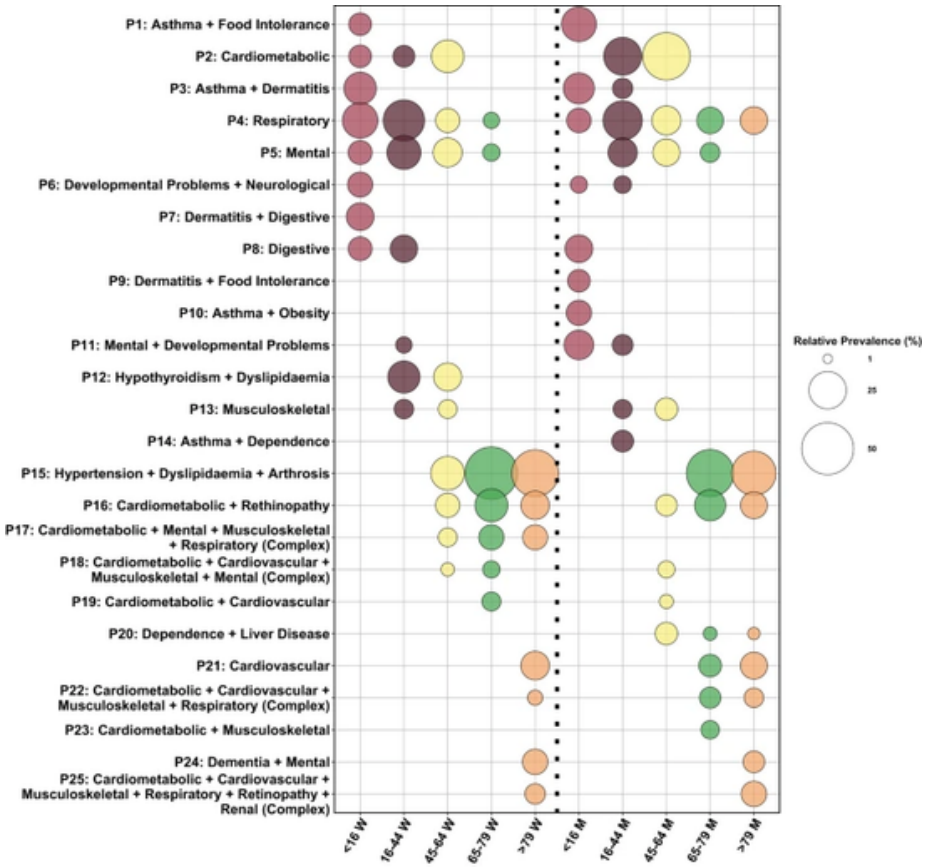
Identifying the main diseases that are taking place helps the researchers distinguish certain issues within their society. For example, using this information and extra data collected from a census of theirs, they were able to detect persistent factors such as age and sex. Using this data, they were also able to determine the region that each condition or demographic is most prevalent in. To conclude, using this data that the researchers had collected. They were able to help affected regions by dispersing treatments for the diseases lowering deathrates and bettering health services.

Further details on their observations are on the next page.

REVOLUTIONARY SCIENTIFIC DISCOVERIES OF THE 20TH CENTURY

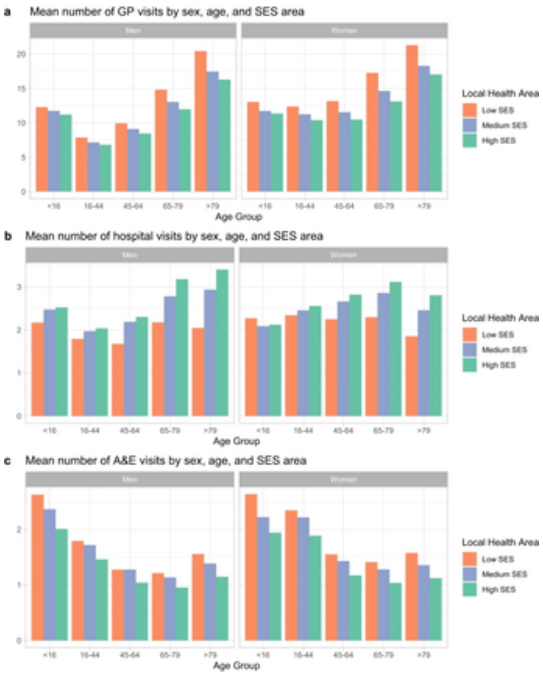
Written By: Oliver Chen

Sophomore at BST Academy



This graph above depicts the multimorbidity pattern distribution and prevalence by sex and age. It shows the relative prevalence for women on the left side and men on the right side.

The graph below shows hospital resources and visits regarding location, sex, and age of patients in South Spain. This would help the researchers determine what treatment is most needed and best depending on the medical situations of these regions.



START-UP COMPANIES IN IMMUNOLOGY

Written By: Carlo Sierra

Sophomore at BST Academy

In recent years, immunology has become more studied because of its importance in the medical field. Immunology, a captivating field of biomedical science, explores the intricacies of the human immune system and its interactions with various pathogens, diseases, and foreign substances. The study of immunology can have an extreme impact on society, as diseases are one of the most prominent causes of deaths, especially in recent years. The development of treatments such as vaccines can easily mitigate unnecessary fatalities. The creation and development of immunity-based treatments often come with a significant cost, meaning that bodies with enough funding are more likely to create treatments. In simpler terms, large-scale companies often have enough resources and governmental support to efficiently develop treatments. Contrastingly, numerous start-up companies, or companies in the early stage of development, have been rapidly creating treatments at the same level of impact as large scale companies. Start-up companies such as Gentibio and EpiBiologics have made prominent progress so far in the field of immunology.

Read further to get a deeper insight into these rising star companies!

START-UP COMPANIES IN IMMUNOLOGY

Written By: Carlo Sierra

Sophomore at BST Academy

Gentibio

Founded in 2020, Gentibio is a company that is currently developing engineered Tregs, or regulatory T-cells, to establish immune tolerance and provide tissue specific immunosuppression to treat patients living with autoimmune, alloimmune, inflammatory and allergic diseases. Their main goal is to replace the need for systemic and less selective immune suppressive therapies. With advanced engineering technologies, Gentibio aims to make an invention that will be able to suppress inflammation, while healing the damaged tissues that can lead to a lasting effect on the homeostasis of the body. The impact of this invention is prospected to be hugely influential, as it would allow people who have target types of diseases to live a normal life. Gentibio is a company that can change the future of the treatments of these diseases.

EpiBiologics

Another Company that also studies in immunology is EpiBiologics. Founded in 2021, EpiBiologics studies the potential of protein degradation to eliminate disease-causing proteins that were previously not addressable by classical therapeutic approaches. Their mission is to to develop first-in-class and best-in-class antibody based targeted therapies against membrane and extracellular proteins that drive underlying disease biology. With the antibodies that they create, it can be effective against a wide range of disorders that lack effective treatments, such as cancer.

The change that start-up companies such as Gentibio and EpiBiologics can be prospected to be enormous.

COMIC: ANTYBODIES

Written By: Marco Mireles
Drawn By: Victoria Lecaro

Sophomores at BST Academy

DISEASES/DEATHS:
A QUIZ MEANT TO BE HARD

Written By: Cillian Leong & Adrian Leong

Freshmen at BST Academy

Question #1 what is not a symptom of the flu?
A) Swollen lymph nodes
B) Weakness
C) Chest pressure
D) Stomach aches

Question #2: What is the most common cause of death?
A) Heart disease
B) Cancer
C) Covid 19
D) Stroke

Question #3: Who was the 14 year old that made a project that could have contributed to the cure for Covid 19?
A) Valerie Houston
B) Brenda Shelton
C) Garry Irwin
D) Anika Chebrolu

Question #4: What is the most common condition out of the four answer choices?
A) Heart disease
B) Cancer
C) Dementia
D) Depression

DISEASES/DEATHS:
A QUIZ MEANT TO BE HARD

Written By: Cillian Leong & Adrian Leong

Freshmen at BST Academy

Question #5: Who discovered the chickenpox prevention treatment?
A) Lucien Christensen
B) Johnny Bradford
C) Michiaki Takahashi
D) Michele Livingston

Question 6: Which autoimmune disease affects the joints and is characterized by inflammation and pain?
A) Diabetes
B) Lupus
C) Rheumatoid arthritis
D) Multiple sclerosis

Question 7: What is the name of the body's first line of defense against pathogens, including the skin and mucous membranes?
A) Adaptive immunity
B) Innate immunity
C) Acquired immunity
D) Cellular immunity

Question 8: What is the main function of antibodies in the immune system?
A) Destroying infected cells
B) Recognizing pathogens
C) Producing cytokines
D) Transporting oxygen

Answer Key: D, A, D, D, C, C, B, B

BST ACADEMY

Written By: Lawrence Kim

Sophomore at BST Academy

The Biomedical Science and Technology Academy at Chino High School is a tuition-free, rigorous magnet program that focuses on two branches of study: Biomedical Science with a Concentration on AI, and Cyber Security. Through specialized courses and a highly supportive environment, students at BST Academy have the opportunity to pursue their interests in a cutting-edge and dynamic field.

Following high school, BST students are prepared to become the innovators of the future and succeed in their respective careers. Students taking the Biomedical Pathway will have a strong foundation in biomedical science and AI. Students taking the Cybersecurity Pathway will have a CISCO Networking Certificate, providing them with a recognized qualification in the field of cybersecurity.

Endless opportunities and long-lasting friendships await you at BST, so take this chance to learn more about us!

Want to Learn More?

Reach out to our Assistant Principal and Dean of Admissions, Mrs. Davis, about any questions you have about BST Academy!

Email: ashley_davis@chino.k12.ca.us
Phone: 909.627.7351 x3150

Or visit our website for more information!
www.chino.k12.ca.us/bstacademy