



THE LIVING SCIENCE

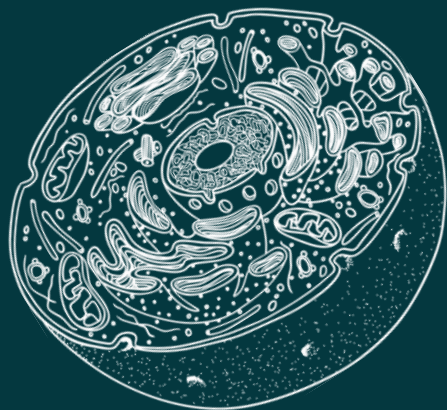
The Biology Club



**CADET COLLEGE
HASANABDAL**

A Not-for-Profit Boarding High School

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Introduction

The Biology Club at Cadet College Hasanabdal provides a dynamic space where students engage in science through hands-on research, teamwork, and creative thinking. Emphasizing project-based learning, the club empowers students to solve real-world biological challenges through long-term investigations. Our students have conducted research on topics such as eucalyptus-based fertilizers, acid rain, plant growth, and water quality, earning us the title of “Best in Pakistan” in the Cambridge Upper Secondary Science Competition 2023. We have proudly hosted the Biological Sciences Symposium under the Round Square framework, fostering leadership, confidence, and global awareness among young scientists from various schools. Club activities span lectures, workshops, lab experiments, indoor sessions, field trips, and online conferences, nurturing critical thinking, creativity, and problem-solving while exposing students to modern biology and valuable skill-building opportunities. Guided by distinguished mentors including Brig (R) Dr. Nadeem Zafar and Prof. Dr. Sohail A. Qureshi, our initiatives align with international science education frameworks such as Round Square and the Cambridge curriculum. More than an academic platform, the Biology Club is a vibrant community where students grow into confident, inquisitive researchers and future leaders in science.

Overview

HISTORY

With a legacy dating back to 1976, the Biology Club continues to play a vital role in promoting scientific curiosity and excellence at Cadet College Hasanabdal. Established by Mr. Mahfooz-ur-Rehman (former Vice Principal and Head of the Biology Department), the club explores life sciences through a multi-dimensional approach. It encourages students to think creatively and critically by proposing innovative, thought-provoking ideas. The club also engages with contemporary biological issues and provides opportunities for students to interact with professionals, broadening their scientific perspective and experience.

AIM

To spark curiosity in biology through hands-on learning, research, and real-world problem solving, fostering a community of creative, collaborative young scientists.

OBJECTIVES



Grade 8th (Members)

1. Introduce them to basic lab equipment and demonstrate how we conduct simple experiments and research activities.
2. Share highlights of the exciting projects, creative model-making, field studies, and competitions that the Biology Club hosts.
3. Encourage them to ask questions, be curious, and envision themselves as future researchers and active club members.

Grade 9th (Participants)

1. Explore biological phenomena using lab kits, visuals, and specimen-based learning.
2. Start project-based learning by creating models, running simple experiments, and presenting ideas.
3. Build a strong foundation for advanced research while preparing for Cambridge Upper Secondary Science Competitions.
4. Focus on curiosity, observation, and scientific thinking to develop a lifelong interest in biology.

Grade 10th (Contributors)

1. Dive into interactive experiments like DNA model building, exploring genetic disorders, and designing awareness campaigns.
2. Take part in advanced research projects and competitions, addressing real-life biological challenges.
3. Work in groups to design public outreach campaigns and propose creative biological solutions.
4. Begin thinking and working like young scientists, connecting biology with society and the future.

Grade 11th (Associates)

1. Deepen biological inquiry through topics like Physiology, Biochemistry, Anatomy, and Microbiology.
2. Construct working models of body systems and use lab tools to observe microscopic organisms in action.
3. Translate theory into lab-based investigations and initiate your own small-scale scientific explorations.
4. Explore interdisciplinary connections between biology, chemistry, and health sciences.
5. Strengthen analytical and lab-based skills, preparing for leadership in scientific research next year.

Grade 12th (Fellows)

1. Step into leadership roles by mentoring junior students, leading research projects, and organizing club activities.
2. Utilize advanced knowledge through Botany, Zoology, Immunology, and Biotechnology to prepare for higher studies and real-world applications.
3. Experience biology beyond the classroom through guest sessions with professionals and exploratory field visits.
4. Develop essential skills like public speaking, teamwork, and project management that extend beyond the classroom.

Research Tracks



Grade 8TH (Members)

01 CELL BIOLOGY

Grade 9TH (Participants)

02 ECOLOGY

GRADE 10th (Contributors)

03 GENETICS

04 EVOLUTION

Grade 11th (Associates)

05 PHYSIOLOGY

06 BIOCHEMISTRY

07 ANATOMY

08 MICROBIOLOGY

Grade 12th (Fellows)

09 BOTANY

10 ZOOLOGY

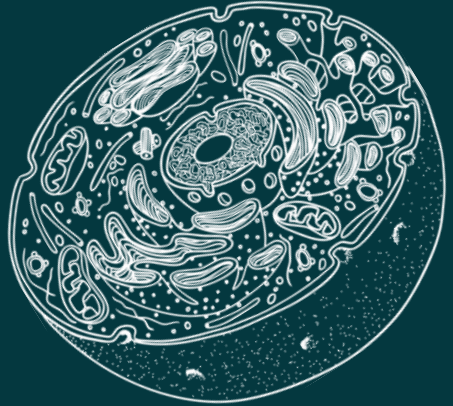
11 IMMUNOLOGY

12 BIOTECHNOLOGY

CELLS

What Should Be Done in Club Activities:

- Construct 3D models of cells using creative materials to represent organelle structure and function.
- Collaboratively label and analyze organelle diagrams to reinforce understanding.
- Design and participate in quiz-based activities focused on cell structure and organelle functions.



Why at This Level:

Cell Biology lays the foundation for understanding all living things. It is a highly visual, structured, and concrete topic, making it ideal for developing early scientific thinking, observation skills, and analytical reasoning.



How It Helps:

- Builds observation and labeling skills
- Encourages curiosity through microscope work
- Prepares for deeper biology concepts like genetics and physiology

ECOLOGY

What Should Be Done in Club Activities:

- Construct food chains and food webs using data from local ecosystems.
- Conduct field observations in gardens, parks, or nearby habitats to study biodiversity.
- Research and chart human impacts on the environment through pollution case studies.
- Develop awareness posters on biodiversity loss and endangered species conservation.

Why at This Level:

Ecology is all around us. It fosters systems thinking and a sense of responsibility toward the environment.

How It Helps:

- Fosters environmental responsibility
- Prepares students for topics like evolution
- Encourages real-world observation and awareness



GENETICS

What Should Be Done in Club Activities:

- Investigate family traits to identify dominant and recessive characteristics.
- Analyze DNA structure through selected video resources and guided discussion.
- Design and construct a DNA double helix model using craft or digital tools.

Why at This Level:

By now, students can understand heredity and patterns. It connects back to cell biology and introduces abstract biological reasoning.

How It Helps:

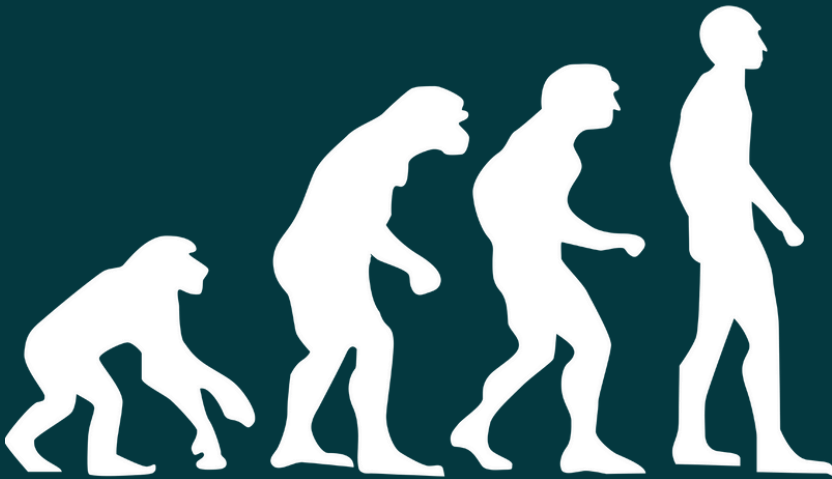
- Strengthens logical and analytical skills
- Makes connections to family traits, health, and agriculture
- Builds a foundation for biotechnology and evolution



EVOLUTION

What Should Be Done in Club Activities:

- Simulate natural selection using simple classroom games
- Analyze fossils and evolutionary trees
- Discuss myths and misconceptions about evolution
- Create presentations on adaptations in animals/plants



Why at This Level:

Evolution helps students synthesize genetics and ecology. Grade 10 is the right stage for critical thinking and scientific explanation of life's diversity.

How It Helps:

- Promotes scientific literacy and curiosity
- Encourages questioning and evidence based reasoning
- Connects biology with history and global perspectives

PHYSIOLOGY

What Should Be Done in Club Activities:

- Create working models of body systems (e.g. lungs, heart)
- Measure pulse, breathing rate, or BP (under supervision)
- Diagram major systems and label organs
- Watch medical case documentaries

Why at This Level:

Students are ready for systems thinking and can link structure to function. It is directly relevant to health sciences and medical interests.



How It Helps:

- Supports understanding of human biology and fitness
- Prepares for careers in medicine and health
- Encourages body awareness and healthy habits

BIOCHEMISTRY

What Should Be Done in Club Activities:

- Perform tests for carbohydrates, proteins, and lipids
- Create molecular models using colored beads or software
- Simulate enzyme-substrate reactions
- Discuss how biochemistry applies to nutrition and health

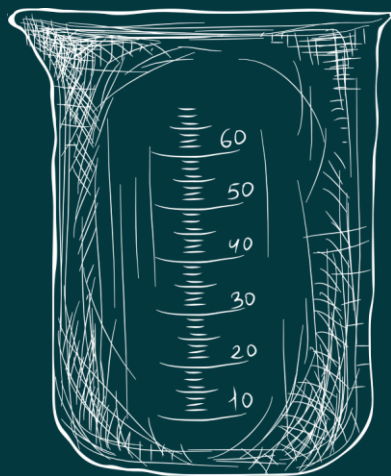
Why at This Level:

This builds on both chemistry and biology, ideal for students mature enough to connect molecular structures to life processes.



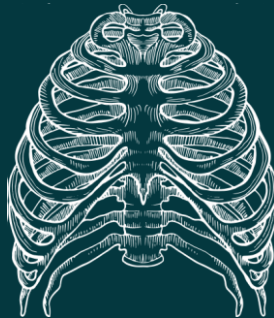
How It Helps:

- Bridges chemistry and biology for pre-med/science students
- Prepares for biotechnological and medical applications
- Strengthens conceptual understanding of nutrition and metabolism



What Should Be Done in Club Activities:

- [illegible]



With developing spatial and observational skills, Grade 11 students can begin to identify, locate, and draw biological structures confidently.

- Improves diagramming and memory skills
- Supports dissection or model-based learning
- Gives visual grounding to physiology and medicine

MICROBIOLOGY

What Should Be Done in Club Activities:

- Conduct a microscopic analysis of prepared slides to study bacterial and fungal morphology.
- Develop and evaluate hygiene campaigns based on public health research.
- Investigate antibiotic mechanisms and analyse patterns of microbial resistance.
- Perform a case-based research study on infectious disease outbreaks (e.g., COVID-19).

Why at This Level:

Students can now understand infectious agents and immunity. It connects well to public health and current global issues like pandemics.

How It Helps:

- Promotes awareness about the importance of disease prevention
- Encourages proper hand hygiene and responsible health practices
- Sparks curiosity in virology and hands-on laboratory research



BOTANY

What Should Be Done in Club Activities:

- Collect, document, and preserve plant specimens to create a mini herbarium.
- Conduct comparative analysis of leaf structures, shapes, and venation patterns.
- Investigate traditional and scientific uses of medicinal plants and local flora.
- Design and perform basic experiments to study operating system in plants.

Why at This Level:

Botany involves deep biological understanding and detail-oriented learning, best introduced once students are mature and capable of abstraction.

How It Helps:

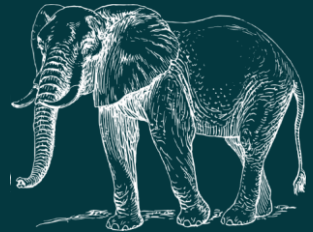
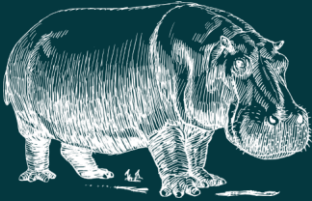
- Connects biology to agriculture, environment, and medicine
- Encourages fieldwork and sustainability
- Develops observation and classification skills



ZOOLOGY

What Should Be Done in Club Activities:

- Analyze animal behavior and habitat adaptations through selected documentaries.
- Compare and contrast key body systems across major animal phyla.
- Conduct a mini research project on endangered species and conservation strategies.



Why at This Level:

Students are now ready to explore life's diversity at a complex level, comparing systems across phyla and thinking evolutionarily.

How It Helps:

- Builds comparative analysis skills
- Inspires interest in animal sciences and veterinary careers
- Supports understanding of biodiversity and conservation

IMMUNOLOGY

What Should Be Done in Club Activities:

- Research and present findings on vaccines, allergies, and immune system disorders.
- Organize an expert talk with a healthcare professional to discuss real-world applications.
- Design awareness materials on vaccine-preventable diseases using scientific data.



Why at This Level:

Immunology is highly interdisciplinary. Grade 12 students can now integrate microbiology, genetics, and physiology to understand immunity.

How It Helps:

- Promotes public health awareness
- Supports vaccine literacy and preventive care
- Prepares for careers in healthcare, diagnostics, and research

BIOTECHNOLOGY

What Should Be Done in Club Activities:

- Simulate DNA extraction using household materials to model genetic techniques.
- Research and debate bioethical issues such as cloning, GMOs, and gene editing.
- Investigate real-world applications of biotechnology in medicine, agriculture, and engineering tools.



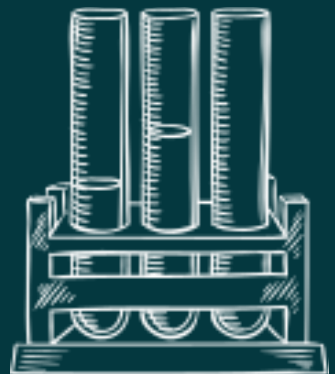
Why at This Level:

Biotech is cutting-edge and demands mature scientific and ethical understanding—perfect for senior students.



How It Helps:

- Sparks innovation and creativity
- Prepares for research and modern STEM careers
- Encourages ethical reasoning and global awareness



RESOURCE LINKS

Learning & Revision

- Khan Academy – Biology

<https://www.khanacademy.org/science/biology>

Short, clear videos and practice exercises on all major biology topics.

- Bozeman Science – Biology Videos

<https://www.bozemanscience.com/biology-main-page>

Engaging video lectures by educator Paul Andersen on AP and general biology.

- HHMI BioInteractive

<https://www.biointeractive.org/>

Animations, virtual labs, and real-world case studies in biology.

Virtual Labs & Simulations

- Learn Genetics (University of Utah)

<https://learn.genetics.utah.edu/>

Interactive activities and visuals on DNA, heredity, and biotechnology.

- PhET Biology Simulations (University of Colorado Boulder)

<https://phet.colorado.edu/en/simulations/category/biology>

Explore biological processes through virtual simulations.

Research & Science News

- National Geographic – Biology

<https://www.nationalgeographic.com/science/biology>

Fascinating stories, discoveries, and animal biology articles.

- Nature – Biology Section

<https://www.nature.com/subjects/biology>

Latest research papers and discoveries in biological sciences.

- Scitable by Nature Education

<https://www.nature.com/scitable/>

Student-friendly articles on genetics, evolution, and molecular biology.



COMPETITIONS AND WORKSHOPS

1 CAMBRIDGE UPPER SECONDARY SCIENCE COMPETITION

Winning the Cambridge Upper Secondary Science Competition at the regional level is a momentous accomplishment for the Biology Club students at Cadet College Hassanabdal. Their success reflects their dedication, deep understanding of biology, and effective teamwork. This victory not only brings pride to the school but also motivates the club to continue excelling in scientific exploration and learning. Congratulations to the Biology Club for this outstanding achievement!

2 NATIONAL BIOLOGY TALENT CONTEST (NBTC)

The National Biology Talent Contest (NBTC) is a prestigious competition that identifies and nurtures talented students in biology. It is part of the National Science Talent Contest (NSTC), and the top participants have the opportunity to represent Pakistan in the International Biology Olympiad (IBO). To participate, students must have completed grades 9, 10, O Levels, 11 (FSc Part-I), or A Levels Part-I with at least 70% marks in Physics, Chemistry, Biology, and Mathematics. The selection process includes a screening test and multiple training camps at the National Institute for Biotechnology & Genetic Engineering (NIBGE) in Faisalabad, where students receive expert guidance and preparation for the final rounds.

3 STEM & STEAM HANDS-ON SCIENCE WORKSHOPS

For students who enjoy hands-on learning, the STEM & STEAM Hands-On Science Workshops by the Pakistan Science Club offer interactive sessions focused on science, technology, engineering, arts, and mathematics. These workshops aim to develop problem-solving skills and creativity through practical experiments. They are held in various cities, including Karachi, and are open to both individual students and school groups.

4 PAKISTAN SCIENCE FOUNDATION (PSF) ESSAY AND POSTER COMPETITIONS

The Pakistan Science Foundation (PSF) organizes essay and poster competitions to encourage students to think critically about scientific topics and present their ideas in innovative ways. These competitions are open to high school students across the country and are conducted through the Boards of Intermediate and Secondary Education (BISE). Winners receive certificates and cash prizes, making this an excellent platform to gain recognition for scientific creativity.

5 NATIONAL SCIENCE BOWL PAKISTAN

A competitive option for quiz enthusiasts is the National Science Bowl Pakistan, which tests students' knowledge in various scientific disciplines, including biology. Schools from across the country participate in regional rounds, with top teams advancing to the national finals. The competition is a great way for students to apply their scientific knowledge in a fast-paced and intellectually stimulating environment.

6 INTERNATIONAL KANGAROO SCIENCE CONTEST (IKSC)

The International Kangaroo Science Contest (IKSC) provides an opportunity for students to engage in problem-solving and critical thinking through a globally recognized science challenge. Participants from different educational levels compete by solving real-world scientific problems. The contest is held annually, and students can register through their schools.

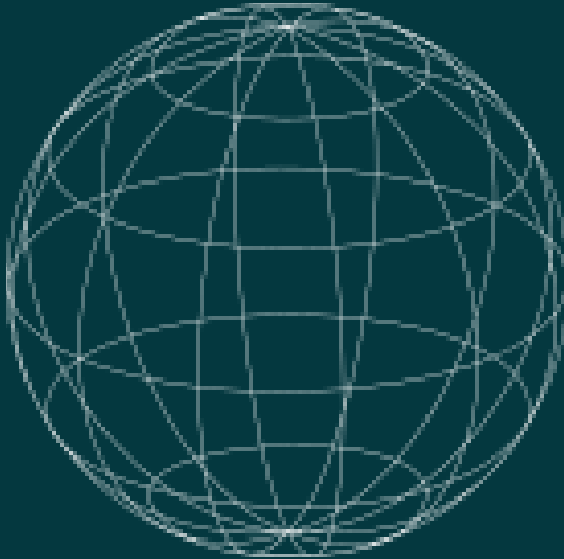
7 SCIENCE CONTEST BY FAMOUS STUDENTS PLATFORM (FSP)

The Science Contest by Famous Students Platform (FSP) is a competition designed for students from class 1 to 10/O-Levels. It aims to develop scientific reasoning and problem-solving skills among young learners. The contest is conducted in various educational institutions across Pakistan, allowing students to participate through their schools.

Officer Incharge

Mr. Talat Masood
HOD Biology Club

Mr. Talat Masood, Head of the Biology Department at CCH, has led the Biology Club for over 21 years. With an M.Phil. in Environmental Sciences, his mentorship helped the club win the title of Best in Pakistan in the Cambridge Science Competition. He continues to inspire student research and scientific curiosity.



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