HARRY PERKINS INSTITUTE OF MEDICAL RESEARCH

Lotterywest BioDiscovery Centre

Year 12: Protein Chemistry

Teacher Information Booklet

Contents

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About the Perkins

About the Perkins

The Harry Perkins Institute of Medical Research, commonly known as The Perkins, is the largest medical research institute in Western Australia working on diseases such as cancer, diabetes, heart disease, and rare genetic diseases.

With over 250 researchers located in three hospital campuses, the Perkins is uniquely positioned to fast track the development of new discoveries and treatments. Researchers at the Perkins are driven to find new ways of diagnosing and treating diseases.

About the Lotterywest BioDiscovery Centre

The Lotterywest BioDiscovery Centre connects students, teachers, and members of the community to the world of medical science and the research happening at the Perkins. Through school visits, community events, and educator resources, we are dedicated to ensuring all Western Australians become more active participants in medical research.

Where to find us

We are located in Nedlands at **6 Verdun St, Nedlands 6009**. See the map below.

Bus parking

Bus parking is organized through QEII parking. Should you require to park your school bus for the day please contact:

- Nicolette.Staal@health.wa.gov.au,
- Qeii.parking@health.wa.gov.au

Or alternatively, call on: (08) 6457 7248

Parking Map


Your Guide to the Perkins
HARRY PERKINS INSTITUTE OF MEDICAL RESEARCH
Footpaths leading to the Perkins
Visitor Parking
Accessible Parking
Drop Off Zone
Bus Stops
Aberdare Rd
N
Gairdner Drive
Cancer Centre Underground Parking
Visitor Car Park 1
Visitor and Staff Multi Deck Parking
(Entry off Winthrop Ave Only)
Hospital Ave
Winthrop Ave
Verdun St
Parking
Neuroscience Research Institute
Lions Eye Institute
Visitor Parking
Main Entrance
Sir Charles Gairdner Hospital
Drop off Zone
Pathwest
Visitor Car Park 3A
Staff Parking
Caledenia Cres
Staff Parking
Crawford Lodge
Ronald McDonald House
Perth Children's Hospital
Monash Ave
Hampden Rd

About your Session

Protein Research at the Perkins

Synthetic Biology is a new field in research, combining biological science with engineering to redesign parts of biological systems (like DNA or proteins) to function in novel ways. For example, genetically engineered organisms such as bacteria and yeast can be "put to work" doing things that would traditionally be done by machines or even humans, such as synthesising chemicals. Researchers can program cells to detect the presence of specific substances, act as logic gates in "biocomputers", or synthesise chemicals never seen in nature!

Professor Oliver Rackham leads the Synthetic Biology and Drug Discovery lab at the Perkins. "Drug discovery" refers to the process of discovering or designing new molecules that have therapeutic properties.

The lab's research has a particular focus on antibiotic resistance – a growing public health problem that threatens to undo centuries of medical progress. Antibiotics are a crucial part of what makes modern medicine, such as surgery, possible. Without effective antibiotics, much of the modern medicine we take for granted will become unviable.

In collaboration with the School of Molecular Sciences at the University of Western Australia, Perkins researchers engineered bakers' yeast to study how some proteins destroy antibiotics. Researchers are also currently working on developing yeast that will produce new antibiotics.

What this session covers

Students spend the session exploring the primary, secondary and tertiary structures of proteins along with the formation of zwitterions and the role of functional groups.

They will then head to the lab for an investigation of antibiotic-resistance proteins. Using their chemical calculation skills and an electrolytic cell, students will carry out protein gel electrophoresis. Replicating the process research scientists use, students will apply their analytical skills to search the Protein Data Bank for key information about their sample. Using this information, students will then propose modifications to the structure of the protein to see if they can transform it into a more effective antibiotic.

Curriculum Links

Year 12 Chemistry Curriculum Unit 4: Organic Chemistry and Chemical Synthesis		
Science Understanding:	**Science as a Human Endeavour:**	**Science Inquiry Skills**
• α-amino acids can be represented using a generalised structure • the sequence of α-amino acids in a protein is called its primary structure • secondary structures of proteins, (α-helix and β-pleated sheets) result from hydrogen bonding between amide and carbonyl functional groups; hydrogen bonding between amide and carbonyl functional groups within a peptide chain leads to α-helix structures while hydrogen bonding between adjacent polypeptide chains leads to β-pleated sheets • the tertiary structure of a protein (the overall three-dimensional shape) is a result of folding due to interactions between the side chains of the α-amino acid in the polypeptide, including disulfide bridges, hydrogen bonding, dipole-dipole interactions, dispersion forces and ionic interactions	• The Protein Data Bank (PDB) houses an international repository of structural data of proteins. The information is accessed and contributed to by scientists worldwide. The function of a protein is closely linked to its structure.	• Conduct investigations safely, competently and methodically for the collection of valid and reliable data.

Terms and Conditions of Booking

Price

Visits are priced at $50 per student for a group of 20 or more students. For a group of less than 20 students, a minimum fee of $1,000 applies. Feel free to contact the education team to organise school sharing opportunities. Cost will be shared proportionately if multiple schools attend a singular day.

For bookings over multiple days, each day will be priced independently.

Once your booking has been confirmed, a $100 per session booking fee will be issued within 10 business days. For bookings in the next calendar year, this booking fee will be issued in the new year, unless requested otherwise.

Numbers

At the time of making your booking, provide an estimate of the number of students that will be attending. You will be emailed a reminder two weeks before your visit to confirm student numbers.

It is the responsibility of the organising teacher to confirm final numbers at least one week prior to their booking. A decrease in the number of participants will not be accepted after this point and schools will be invoiced accordingly.

Photo Consent Policy

The Harry Perkins Institute of Medical Research may use photos taken during the session for publicity purposes unless otherwise agreed upon. The school can opt-out of this arrangement through the booking confirmation form, or through written notice to the education team at any time before or after the excursion.

Timing

Sessions run from 9:30 am – 2:30 pm. Alternative times must be arranged ahead of the session.

Cancellation Policy

The Lotterywest BioDiscovery Centre at the Harry Perkins Institute for Medical Research requests one month's notice for the cancellation of a school's booking. If this notice is not given, the school will be charged at 50% of the original cost of the excursion or session.

Cancellations will not be accepted with less than one week's notice.

Shared Classes

If the total number of students in a shared class drops below 20, all schools attending that day will split the $1000 minimum fee proportionally to the number students attending.

Duty of Care

School staff are to always remain with students. Staff at the Harry Perkins of Medical Research do not hold duty of care over school students and are not responsible for personally caring for students. Should there be any attendee with a medical condition, disability, mobility issue or special learning requirements, the school is required to attend with two adults who can accept responsibility for duty of care.

On the Day

What your students need to bring

Students must bring their own food and drink. Pens and workbooks are provided.

Note: On-site cafés are not accessible for students or staff during their visit.

PC2 Compliance

All teachers and students must comply by expectations for our Physical Containment Level 2 (PC2) as set by the Institutional Biosafety Committee (C-IBC). This means students and staff must wear fully enclosed shoes, and all hair/fringes tied back and off face. Phones, bags, food or drink (including water) are not permitted in the PC2 lab area.

Working With Children Check Confirmation

It is a condition of employment at the Lotterywest BioDiscovery Centre that all demonstrator staff have a current Working With Children Card.