Structure and Biophysical properties of Nucleic Acids

CHEM40250

Session 1 (New Seminar Room, School of Chemistry, TCD)
9.30 – 13.00 Thursday 18th May 2017

Lecture 1: (9.30 – 10.00)
Introduction
Prof. John Kelly (TCD Chemistry)

Lecture 2: (10:10 – 11.00)
Prof. Chris Cardin (University of Reading)
X-ray crystallography for nucleic acid structure determination.
Crystal growth, measurements, model building lattices vs molecules, structural databases, derived parameters, software.

Lecture 3: (11.30 – 12.15)
Prof. Chris Cardin (University of Reading)
DNA structure - the classic duplexes, higher order structures (Holliday junction, G-quadruplex, i-motif), ligand binding as studied by crystallography, some textbook and recent examples.

Session 2 Physical Techniques for Characterization of Nucleic Acids in solution

Lecture 4: (14.00 – 15.00)
Spectroscopic Characterization (Part 1)
Stability of DNA: Dynamics and Energetics
Dr. Susan Quinn (UCD Chemistry)
Optical UV-visible Spectroscopy, Circular & Linear Dichroism,
-Zipper model
-hysteresis annealing and melting T_m
-Stabilizing and destabilizing factors

Lecture 5 (15.00 – 16.00)
Spectroscopic Characterization (Part 2)
Prof. John Kelly (TCD Chemistry)
NMR, Vibrational Spectroscopy (IR and Raman),

Lecture 6: (16.00 – 17.00)
Other DNA characterisation methods
Prof. John Kelly (TCD Chemistry)
Microscopy, Gel electrophoresis. Hydrodynamics. Supercoiled DNA

Session 3 Synthetic Method and DNA Ligand Binding

9.15 – 11.45 Friday 19th May 2017
(New Seminar Room, School of Chemistry,)

Lecture 7: (9.30 – 10.20)
Synthetic methods
Prof. Isabel Rozas (TCD Chemistry)
Synthesis of oligonucleotides

Lecture 8: (10:25 – 11.15)
DNA Binding structure as elucidated by X-ray diffraction
Prof. Chris Cardin (University of Reading)

Lecture 9: (11.45- 12.45)
Molecular Modelling of nucleic acids and their binding interactions
Prof. Isabel Rozas (TCD Chemistry)

Session 4 DNA Ligand Binding Condt.

Lecture 10 (14.00 – 14.45)
DNA Ligand Binding
Dr. Susan Quinn (Chemistry, University of Reading)
Application of a range of spectroscopic, crystallography and other methods, such as Gel Electrophoresis, Viscosity, Dialysis, Isothermal Calorimetry, to determine properties of different modes of binding

Lecture 11 (15:00– 15.45)
DNA Ligand Binding - Covalent-Binding
Prof. John Kelly (TCD Chemistry)

Lecture 12: (15:45-16:30)
Nanotechnology applications of DNA
Dr. Susan Quinn (UCD Chemistry)