The Cell: Molecules and Processes (CMP) provides ground to understand the relationships between molecular and cell biology, genetics, and medicine. The course will particularly emphasize presentation and critical discussion of the major biological functions at a molecular level, and will provide the foundations for medical genetics, which will be further developed during the second year. The knoy l be

Building Bodies course (1 year, 1 semester). Students are also expected to know the structure and properties of water and biomolecules, as described in the course “Principle of the Living Matter” (1 year, 1 semester).

: Prokaryotic and eukaryotic cell organization. From prokaryotic to eukaryotic cells: the endosymbiotic theory.

: Lecture

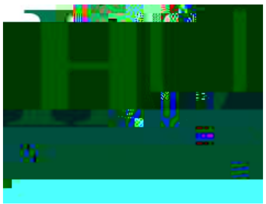
Illustrate how the cell represents the fundamental unit of life

Discuss the main structural differences between prokaryotic and eukaryotic cell

Discuss how eukaryotic cells might have evolved

Darwin, Wallace and the origin of species. Example of application of the evolution theory in medicine.

FLIPPED Classroom, including asynchronous individual work at home



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: Lecture

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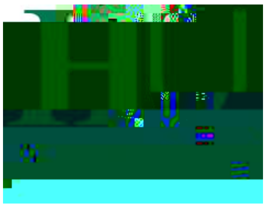
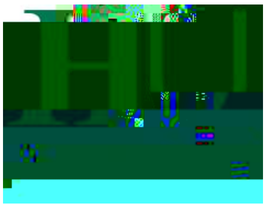
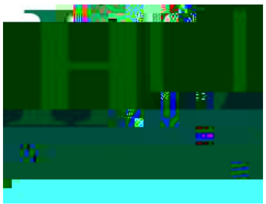




- **Describe the stages of mitosis and explain the significance of each step**
- **Describe the main cytoskeletal structures involved in cell division**

  : pharmacological agents affecting the function of microtubules



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- **Understand genetic and environmental contribution to carcinogenesis**
- **Understand the altered properties of cancer cells and cancer heterogeneity**
- **Discuss tumor progression by multiple mutations**
- **Discuss the differences between oncogenes and tumor suppressors**
- **Discuss molecular mechanisms of oncogenesis**

: Properties and sources of stem cells. Induced pluripotent stem cells. Modelling diseases with iPSCs and organoids

: Lecture

- **Understand the basic properties of stem cells, the concepts of potency, cell fate determination, and reprogramming**
- **Understand the differences between embryonic stem cells, adult stem cells and induced-pluripotent stem cells (iPSCs), and organoids**
- **Describe the applications of stem cell research in medicine**

: Classification of viruses: DNA and RNA viruses. Structure of viral particles. Viral tropism. The cycle and the genome organization of retroviruses. Role in human disease. Use of viral vectors for gene therapy.

: Lecture

- **Describe the structure of the main classes of animal viruses**
- **Understand the differences between naked and enveloped viruses (e.g. structure, infection cycle)**
- **Understand general principles guiding viral replication**
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