

## TOPIC 1: CELL BIOLOGY

### 1.1. Introduction to cells

#### Cell theory:

- All living things are composed of cells
- The cell is the smallest unit of life
- Cells only arise from pre-existing cells

#### Atypical examples

- **Striated muscle** → (challenge: one nucleus) long and multi-nucleated
- **Fungal hyphae** → (challenge: single unit) very large, multi-nucleated, continuous cytoplasm
- **Glaciar cells** → (challenge: simple and small) gigantic, complex form

#### Functions of life (MR TIGRIN)

1. **Metabolism** – all the chemical reactions in the cell which are responsible for all the actions of organisms (e.g. respiration)
2. **Response** – living things can respond to changes in the environmental conditions
3. **Homeostasis** – the maintenance and regulation of internal cell conditions (e.g. water and pH)
4. **Growth** – living things can grow or change in size/shape
5. **Reproduction** – living things reproduce offspring
  - **Sexual reproduction** (two parents)
  - **Asexual reproduction** (one parent)
6. **Excretion** – the removal of metabolic waste
7. **Nutrition** – feeding by either the synthesis of organic molecules (e.g. photosynthesis) or the absorption of organic matter

#### Surface Area : Volume

Plasma membrane is responsible for import/export in the cell.

#### SMALLER THE CELL:

- Better to **lose heat** so that enzymes do not denature
- Greater SA:Vol ratio for diffusion → **cell more efficient**
- Diffusion pathway is shorter → cell more efficient

#### GREATER THE CELL:

- Decreased SA:Vol ratio → cell conserve better heat

**Example 1:** Intestine folded covered of villi and microvilli → create larger SA:Vol → greater rate of absorption

**Example 2:** Lungs made of alveoli → create larger SA:Vol

#### Magnification Formula



$$1\text{mm} = 1000\mu\text{m (micrometres)}$$

$$1\text{mm} = 1.000.000\text{nm (nanometres)}$$

# Sl Ib Biology 2013 Paper 1

**Lars Kaestner, Anna Bogdanova**



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Introducing the IB Diploma Programme Marc Abrioux, Jill Rutherford, 2013-02-14 Schools wishing to introduce the IB diploma programme are faced with major investment in terms of time effort and money in order to become authorised This manual is a resource for schools already offering the diploma as well as for prospective diploma schools *Principles of Virology, Volume 2* S. Jane Flint, Vincent R. Racaniello, Glenn F. Rall, Theodora Hatzioannou, Anna Marie Skalka, 2020-11-03 Principles of Virology the leading virology textbook in use is an extremely valuable and highly informative presentation of virology at the interface of modern cell biology and immunology This text utilizes a uniquely rational approach by highlighting common principles and processes across all viruses Using a set of representative viruses to illustrate the breadth of viral complexity students are able to understand viral reproduction and pathogenesis and are equipped with the necessary tools for future encounters with new or understudied viruses This fifth edition was updated to keep pace with the ever changing field of virology In addition to the beloved full color illustrations video interviews with leading scientists movies and links to exciting blogposts on relevant topics this edition includes study questions and active learning puzzles in each chapter as well as short descriptions regarding the key messages of references of special interest Volume I Molecular Biology focuses on the molecular processes of viral reproduction from entry through release Volume II Pathogenesis and Control addresses the interplay between viruses and their host organisms on both the micro and macroscale including chapters on public health the immune response vaccines and other antiviral strategies viral evolution and a brand new chapter on the therapeutic uses of viruses These two volumes can be used for separate courses or together in a single course Each includes a unique appendix glossary and links to internet resources Principles of Virology Fifth Edition is ideal for teaching the strategies by which all viruses reproduce spread within a host and are maintained within populations This edition carefully reflects the results of extensive vetting and feedback received from course instructors and students making this renowned textbook even more appropriate for undergraduate and graduate courses in virology microbiology and infectious diseases *Biostimulants in Agriculture II: Towards a Sustainable Future* Maurizio Ruzzi, Giuseppe Colla, Youssef Roupheal, 2024-06-11 Modern agriculture needs to review and broaden its practices and business models by integrating opportunities coming from different adjacent sectors and value chains including the bio based industry in a fully circular economy strategy Searching for new tools and technologies to increase crop productivity under optimal and sub optimal conditions and to improve resources use efficiency is crucial to ensure food security while preserving soil quality microbial biodiversity and providing business opportunities for farmers Biostimulants based on microorganisms or organic substances obtained from renewable materials represent a sustainable efficient technology or complement to synthetic counterparts to improve nutrient use efficiency and secure crop yield stability Under the new European Union Regulation 2019 1009 plant biostimulants were defined based on four agricultural functional claims as follows Plant biostimulants are products that

stimulate plant nutrition processes independently of the product's nutrient content with the sole aim of improving one or more of the following characteristics of the plant and/or the plant rhizosphere: 1 nutrient use efficiency 2 tolerance/resistance to a biotic stress 3 quality characteristics or 4 availability of confined nutrients in the soil or rhizosphere. Many diverse natural substances and chemical derivatives of natural or synthetic compounds, as well as beneficial microorganisms, are cataloged as plant biostimulants, including: i humic substances ii plant or animal based protein hydrolysates iii macro and micro algal extracts iv silicon v arbuscular mycorrhizal fungi (AMF) and vi plant growth promoting rhizobacteria (PGPR) belonging to the *Azotobacter*, *Azospirillum* and *Rhizobium* genera. [King Tyrant Mark P. Witton, 2025-05-13](#)

*King Tyrant: A Natural History of Tyrannosaurus Rex* is an accessible synthesis of our understanding of the evolutionary position, life history, and biomechanics of the T. rex. It explores answers to classic questions such as: how fast could it run? what were its small arms for? or was it a predator or scavenger? At the same time, it uncovers new questions like: was it one species or many? and what did it look like? The text also delves into our own relationship with T. rex, from a historic overview to pop culture references, and discusses whether our love for the dinosaur has helped or hindered our research and understanding. **Oxford**

**Resources for IB DP Biology: Course Book ebook** Andrew Allott, David Mindorff, 2023-04-06. Featuring a wealth of engaging content, this concept-based Course Book has been developed in cooperation with the IB to provide the most comprehensive support for the DP Biology specification for first teaching from September 2023. Created by experienced IB authors, examiners, and teachers, it is packed with activities, questions, and opportunities to regularly practice, plus extensive assessment preparation support. Use this print Course Book alongside the digital course on Oxford's Kerboodle platform for the best teaching and learning experience. Oxford's DP Science offer brings together the IB curriculum and future-facing functionality, enabling success in DP and beyond. *Role of Lipids in Virus Assembly* Jamil S. Saad, Delphine M.

Muriaux, 2015-07-28. RNA enveloped viruses comprise several families belonging to plus and minus strand RNA viruses, such as retroviruses, flaviviruses, and orthomyxoviruses. Viruses utilize cellular lipids during critical steps of replication, like entry, assembly, and egress. Growing evidence indicates important roles for lipids and lipid nanodomains in virus assembly. This special topic covers key aspects of virus membrane interactions during assembly and egress, especially those of retroviruses and Ebola virus (EBOV). Virus assembly and release involve specific and nonspecific interactions between viral proteins and membrane compartments. Retroviral Gag proteins assemble predominantly on the PM. Despite the great progress in identifying the factors that modulate retroviral Gag assembly on the PM, there are still gaps in our understanding of precise mechanisms of Gag membrane interactions. Studies over the last two decades have focused on the mechanisms by which other retroviral Gag proteins interact with membranes during assembly. These include human immunodeficiency virus (HIV), Rous sarcoma virus (RSV), equine infectious anemia virus (EIAV), Mason-Pfizer monkey virus (M-PMV), murine leukemia virus (MLV), and human T-lymphotropic virus type 1 (HTLV-1). Additionally, assembly of filoviruses such as EBOV also occurs on the inner

leaflet of the PM The articles published under this special topic highlight the latest understanding of the role of membrane lipids during virus assembly egress and release      **Ebook: Life-Span Development** Santrock,2016-09-16 Ebook Life Span Development      **Ebook: Child Development: An Introduction** John Santrock,2014-10-16 Accurate Reliable Engaging These are just a few of the words used by adopters and reviewers of John Santrock s Child Development The new topically organised fourteenth edition continues with Santrock s highly contemporary tone and focus featuring over 1 000 new citations The popular Connections theme shows students the different aspects of children s development to help them better understand the concepts Used by hundreds of thousands of students over thirteen editions Santrock s proven learning goals system provides a clear roadmap to course mastery      *Backpacker* ,2001-03 Backpacker brings the outdoors straight to the reader s doorstep inspiring and enabling them to go more places and enjoy nature more often The authority on active adventure Backpacker is the world s first GPS enabled magazine and the only magazine whose editors personally test the hiking trails camping gear and survival tips they publish Backpacker s Editors Choice Awards an industry honor recognizing design feature and product innovation has become the gold standard against which all other outdoor industry awards are measured      Ebook: The Science of Psychology: An Appreciative View King,2016-09-16 Ebook The Science of Psychology An Appreciative View      **Iguazu Falls** Marcelo José da Silva de Magalhães,2021-01-01 Dear reader I am sure that the Iguazu National Park is among the tourist places where the natural beauty most enchanted me Even after visiting it for the second time the excitement is still the same This majestic park is the most visited in Argentina and is among the three most visited tourist spots in Brazil It is among the most well classified tourist sites as World Heritage Site Just visit it to understand these numbers Its beauty may not be described through words or photos It is necessary to be there and feel to live the essence of that place Iguazu River is huge noisy and is characterized by numerous waterfalls which are simply fantastic In the second half of the book will be presenting to you the bird park that is located in Brazil near the Iguassu National Park The bird park is a must see tourist spot for nature lovers I hope this book can give you an idea of the magic of that place I hope you can one day visit and share the same opinion      **The Red Cell Life-Cycle From Erythropoiesis to Clearance** Lars Kaestner,Anna Bogdanova,2019-02-05 The eBook The red cell life cycle from erythropoiesis to clearance continues the discussion of questions like What are the changes associated with red blood cell maturation adulthood and senescence What are the determinants of red blood cell life span and clearance What are the mechanisms in control of red blood cell mass in healthy humans and patients with various forms of anaemia Can red blood cells be trained to provide the body with more oxygen during endurance exercises What are the markers of circulating red blood cell senescence and in cells during storage and transfusion And what can be learned from various species that developed advanced adaptations to maintain oxygen delivery under stress conditions such as exercising to the limit diving or living in anaerobic aquatic habitats or at high altitude Within the approximately 120 days or 40 in a mouse or 150 170 in a horse life span of healthy red blood cells many cellular

properties change leading to aged mixed cell populations in the circulation Red blood cells seem to be genetically terminated by the time they become red blood cells and the contributions of this eBook increase the understanding of this process There are surprisingly versatile remodeling processes happening during the red blood cell life span Numerous disorders are associated with the premature onset of the ageing process of red blood cells Furthermore in vitro ageing and or modifications as well as the slowing down of the modifications is an important issue in transfusion medicine Many of the molecular mechanisms behind such effects are elucidated in this eBook

**Biological Invasions and Its Management in China** Fanghao Wan,Mingxing Jiang,Aibin Zhan,2017-04-25 The book discusses invasive species problems in agriculture forests and aquatic ecosystems highlighting the invasive mechanisms and management of the selected invasive species Biological invasion has become a serious global ecological and economic problem that deserves particular attention from both government officials and scientists This volume focuses on three key scientific areas 1 population establishment and spreading mechanisms of the selected invasive species 2 ecology adaptation population growth expansion and evolution of invasive species and 3 impact of bio invasion on the ecosystem structure and function at community and ecosystem levels The presented research will result in techniques for better management of invasive species

**Cells and Materials for Disease Modeling and Regenerative Medicine** Ander Abarrategi,Senentxu Lanceros-Mendez,2021-05-05 Materials science and engineering are strongly developing tools with increasing impact in the biotechnological and biomedical areas Interestingly research in molecular and cellular biology is often at the core of the design and development of materials based approaches providing biological rationale Focused on research relying on biology materials interaction IJMS launched a Special Issue named Cells and Materials for Disease Modeling and Regenerative Medicine The aim of the Special Issue was to generate a compilation of in vitro and in vivo strategies based on cell material interactions This book compiles the papers published in that Special Issue and includes a selection of six original scientific experimental articles and six comprehensive reviews We are convinced that this collection of articles shows representative examples of the state of the art in the field unveiling the relevance of materials research in generating new regenerative medicine and disease modeling approaches

*Psychocardiology: Exploring the Brain-Heart Interface* Kai G. Kahl,Marlies Elizabeth Alvarenga,Don Byrne,2022-09-23

**Climate Change and Infectious Fish Diseases** Patrick T.K. Woo,Jo-Ann Leong,Kurt Buchmann,2020-09-04 This definitive reference work explores the effects of current and expected climate change taking place throughout the world on selected bacterial viral fungal and parasitic infectious fish diseases of economically important fish in tropical and temperate waters

Cold-Water Coral Reefs of the World Erik Cordes,Furu Mienis,2023-12-27 Cold water corals form reef structures in continental margin and seamount settings world wide making them more wide spread and abundant than shallow water reefs Their role in these ecosystems is no less important than the influence that shallow water coral reefs have on tropical systems They create habitat structure host endemic species enhance elemental cycling alter current flow sequester carbon

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**Principles of Virology** Jane Flint, Vincent R. Racaniello, Glenn F. Rall, Theodora Hatzioannou, Anna Marie Skalka, 2020-08-07 Principles of Virology the leading virology textbook in use is an extremely valuable and highly informative presentation of virology at the interface of modern cell biology and immunology This text utilizes a uniquely rational approach by highlighting common principles and processes across all viruses Using a set of representative viruses to illustrate the breadth of viral complexity students are able to understand viral reproduction and pathogenesis and are equipped with the necessary tools for future encounters with new or understudied viruses This fifth edition was updated to keep pace with the ever changing field of virology In addition to the beloved full color illustrations video interviews with leading scientists movies and links to exciting blogposts on relevant topics this edition includes study questions and active learning puzzles in each chapter as well as short descriptions regarding the key messages of references of special interest Volume I Molecular Biology focuses on the molecular processes of viral reproduction from entry through release Volume II Pathogenesis and Control addresses the interplay between viruses and their host organisms on both the micro and macroscale including chapters on public health the immune response vaccines and other antiviral strategies viral evolution and a brand new chapter on the therapeutic uses of viruses These two volumes can be used for separate courses or together in a single course Each includes a unique appendix glossary and links to internet resources Principles of Virology Fifth Edition is ideal for teaching the strategies by which all viruses reproduce spread within a host and are maintained within populations This edition carefully reflects the results of extensive vetting and feedback received from course instructors and students making this renowned textbook even more appropriate for undergraduate and graduate courses in virology microbiology and infectious diseases

[Proceedings of the Fourth World Conference on Floating Solutions: WCFS 2024; 2-4 December; Hong Kong](#) Xiao Lin Zhao, Jian-Guo Dai, Siwei Liu, Soon Heng Lim, 2025-06-24 This book highlights recent research and development in floating solutions for sustainable ocean development and blue economy It covers the following key topics Architecture climate change and disaster environmental enhancement food security and food sustainability innovation and technology renewable energy urban planning policy social acceptance and legal matters This book is of interest to architectures engineers consultants manufactures government officials researchers academics and postgraduate students related to floating solutions

*Photosynthesis Under Fluctuating Light* Michele Grieco, Fiamma Longoni, Stefano Santabarbara, Jeremy Harbinson, 2023-06-27 Photosynthesis is a fundamental process that drives almost all life on Earth and is the motor of agriculture and food production For several decades its basic

functioning has been investigated mainly at steady state under constant illumination. This approach was necessary to understand the basic mechanisms underlying the light reactions and carbon assimilation. However, this condition does not reflect the natural environment where plants experience changes in both the intensity and spectrum of irradiance in a wide range of time scales spanning from seconds to several hours. In recent years, it has become clear that the processes allowing the photosynthetic apparatus to adapt to changes in irradiance are of paramount importance to plant fitness and productivity. Therefore, increased research effort has been directed towards studying the regulation of photosynthetic activity under fluctuating light, i.e. upon the variation of light intensity or light spectrum. This is important for understanding how photosynthetic organisms cope with natural environmental conditions. Fluctuating light itself constitutes a potentially stressful condition because, depending on the scale of the fluctuation, it can transiently generate extreme redox and transthylakoid potentials and forces the photosynthetic machinery to be re-adjusted. Not surprisingly, plants have evolved several mechanisms allowing a prompt response to these normal environmental events. In natural environments, photosynthetic organisms often have to cope with fluctuating light while experiencing other kinds of stress such as heat, nutrient deficiency, drought, and pathogen attacks. Therefore, the study of combined stresses is essential for understanding the acclimation to realistic environmental conditions.



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