AP Biology

Syllabus Checklist · 大纲自查表

Tick one box per statement: ☐ not yet ☐ nearly ☐ confident. 每条打一个勾：尚未掌握 / 快会了 / 有把握。

1. Chemistry of Life 生命的化学

1.1 Structure of Water and Hydrogen Bonding 水的结构与氢键

☐☐☐ Explain how the properties of water that result from its polarity and hydrogen bonding affect its biological function.

1.2 Elements of Life 生命元素

☐☐☐ Describe the composition of macromolecules required by living organisms.

1.3 Introduction to Macromolecules 大分子导论

☐☐☐ Describe the chemical reactions that build and break biological macromolecules.

1.4 Carbohydrates 碳水化合物

☐☐☐ Describe the structure and function of carbohydrates.

1.5 Lipids 脂质

☐☐☐ Describe the structure and function of lipids.

1.6 Nucleic Acids 核酸

☐☐☐ Describe the structure and function of DNA and RNA.

1.7 Proteins 蛋白质

☐☐☐ Describe the structure and function of proteins.

2. Cell Structure and Function 细胞结构与功能

2.1 Cell Structure and Function 细胞结构与功能

☐☐☐ Explain how the structure and function of subcellular components and organelles contribute to the function of cells.

2.2 Cell Size 细胞大小

☐☐☐ Explain the effect of surface area-to-volume ratios on the exchange of materials between cells or organisms and the environment.

2.3 Plasma Membrane 质膜

☐☐☐ Describe the roles of each of the components of the cell membrane in maintaining the internal environment of the cell.

☐☐☐ Describe the fluid mosaic model of cell membranes.

2.4 Membrane Permeability 膜的通透性

☐☐☐ Explain how the structure of biological membranes influences selective permeability.

☐☐☐ Describe the role of the cell wall in maintaining cell structure and function.

2.5 Membrane Transport 膜运输

☐☐☐ Describe the mechanisms that organisms use to maintain solute and water balance.

☐☐☐ Describe the mechanisms that organisms use to transport large molecules across the plasma membrane.

2.6 Facilitated Diffusion 易化扩散

☐☐☐ Explain how the structure of a molecule affects its ability to pass through the plasma membrane.

2.7 Tonicity and Osmoregulation 渗透压与渗透调节

☐☐☐ Explain how concentration gradients affect the movement of molecules across membranes.

☐☐☐ Explain how osmoregulatory mechanisms contribute to the health and survival of organisms.

2.8 Mechanisms of Transport 运输机制

☐☐☐ Describe the processes that allow ions and other molecules to move across membranes.

2.9 Cell Compartmentalization 细胞区室化

☐☐☐ Describe the membrane-bound structures of the eukaryotic cell.

☐☐☐ Explain how internal membranes and membrane-bound organelles contribute to compartmentalization of eukaryotic cell functions.

2.10 Origins of Cell Compartmentalization 细胞区室化的起源

☐☐☐ Describe similarities and/or differences in compartmentalization between prokaryotic and eukaryotic cells.

3. Cellular Energetics 细胞能量学

3.1 Enzymes 酶

☐☐☐ Explain how enzymes affect the rate of biological reactions.

3.2 Environmental Impacts on Enzyme Function 环境对酶功能的影响

☐☐☐ Explain how changes to the structure of an enzyme may affect its function.

☐☐☐ Explain how the cellular environment affects enzyme activity.

3.3 Cellular Energy 细胞能量

☐☐☐ Describe the role of energy in living organisms.

☐☐☐ Explain how shared, conserved, and fundamental processes and features support the concept of common ancestry for all organisms.

3.4 Photosynthesis 光合作用

☐☐☐ Describe the photosynthetic processes and structural features of the chloroplast that allow organisms to capture and store energy.

☐☐☐ Explain how cells capture energy from light and transfer it to biological molecules for storage and use.

3.5 Cellular Respiration 细胞呼吸

☐☐☐ Describe the processes and structural features of mitochondria that allow organisms to use energy stored in biological macromolecules.

☐☐☐ Explain how cells obtain energy from biological macromolecules in order to power cellular functions.

4. Cell Communication and Cell Cycle 细胞通讯与细胞周期

4.1 Cell Communication 细胞通讯

☐☐☐ Describe the ways that cells can communicate with one another.

☐☐☐ Explain how cells communicate with one another over short and long distances.

4.2 Introduction to Signal Transduction 信号转导导论

☐☐☐ Describe the components of a signal transduction pathway.

☐☐☐ Describe the role of components of a signal transduction pathway in producing a cellular response.

4.3 Signal Transduction Pathways 信号转导通路

☐☐☐ Describe the different types of cellular responses elicited by a signal transduction pathway.

☐☐☐ Explain how a change in the structure of any signaling molecule affects the activity of the signaling pathway.

4.4 Feedback 反馈

☐☐☐ Explain how positive and negative feedback helps maintain homeostasis.

4.5 Cell Cycle 细胞周期

☐☐☐ Describe the events that occur in the cell cycle.

☐☐☐ Explain how mitosis results in the transmission of chromosomes from one generation of cells to the next.

4.6 Regulation of Cell Cycle 细胞周期的调控

☐☐☐ Describe the role of checkpoints in regulating the cell cycle.

☐☐☐ Describe the effects of disruptions to the cell cycle on the cell or organism.

5. Heredity 遗传

5.1 Meiosis 减数分裂

☐☐☐ Explain how meiosis results in the transmission of chromosomes from one generation to the next.

☐☐☐ Describe similarities and differences between the phases and outcomes of mitosis and meiosis.

5.2 Meiosis and Genetic Diversity 减数分裂与遗传多样性

☐☐☐ Explain how the process of meiosis generates genetic diversity.

5.3 Mendelian Genetics 孟德尔遗传学

☐☐☐ Explain the inheritance of genes and traits as described by Mendel's laws.

5.4 Non-Mendelian Genetics 非孟德尔遗传学

☐☐☐ Explain deviations from Mendel's model of the inheritance of traits.

5.5 Environmental Effects on Phenotype 环境对表型的影响

☐☐☐ Explain how the same genotype can result in multiple phenotypes under different environmental conditions.

6. Gene Expression and Regulation 基因表达与调控

6.1 DNA and RNA Structure DNA 与 RNA 的结构

☐☐☐ Describe the structures involved in passing hereditary information from one generation to the next.

☐☐☐ Describe the characteristics of DNA that allow it to be used as hereditary material.

6.2 DNA Replication DNA 复制

☐☐☐ Describe the mechanisms by which genetic information is copied for transmission between generations.

6.3 Transcription and RNA Processing 转录与 RNA 加工

☐☐☐ Describe the mechanisms by which genetic information flows from DNA to RNA to protein.

6.4 Translation 翻译

☐☐☐ Explain how the phenotype of an organism is determined by its genotype.

6.5 Regulation of Gene Expression 基因表达的调控

☐☐☐ Describe the types of interactions that regulate gene expression.

☐☐☐ Explain how the location of regulatory sequences relates to their function.

6.6 Gene Expression and Cell Specialization 基因表达与细胞特化

☐☐☐ Explain how the binding of transcription factors to promoter regions affects gene expression and the phenotype of the organism.

☐☐☐ Explain the connection between the regulation of gene expression and phenotypic differences in cells and organisms.

6.7 Mutations 突变

☐☐☐ Describe the various types of mutation.

☐☐☐ Explain how changes in genotype may result in changes in phenotype.

☐☐☐ Explain how alterations in DNA sequences contribute to variation that can be subject to natural selection.

6.8 Biotechnology 生物技术

☐☐☐ Explain the use of genetic engineering techniques in analyzing or manipulating DNA.

7. Natural Selection 自然选择

7.1 Introduction to Natural Selection 自然选择导论

☐☐☐ Describe the causes of natural selection.
☐☐☐ Explain how natural selection affects populations.

7.2 Natural Selection 自然选择

☐☐☐ Describe the importance of phenotypic variation in a population.
☐☐☐ Explain how variation in molecules within cells connects to the fitness of an organism.

7.3 Artificial Selection 人工选择

☐☐☐ Explain how humans can affect diversity within a population.

7.4 Population Genetics 群体遗传学

☐☐☐ Explain how random occurrences affect the genetic makeup of a population.
☐☐☐ Describe the role of random processes in the evolution of specific populations.
☐☐☐ Describe the change in the genetic makeup of a population over time.

7.5 Hardy-Weinberg Equilibrium 哈迪-温伯格平衡

☐☐☐ Describe the conditions under which allele and genotype frequencies will change in populations.

7.6 Evidence of Evolution 进化的证据

☐☐☐ Describe the types of data that provide evidence for evolution.
☐☐☐ Explain how morphological, biochemical, and geological data provide evidence that organisms have changed over time.

7.7 Common Ancestry 共同祖先

☐☐☐ Describe structural and functional evidence on cellular and molecular levels that provides evidence for the common ancestry of all eukaryotes.

7.8 Continuing Evolution 持续进化

☐☐☐ Explain how evolution is an ongoing process in all living organisms.

7.9 Phylogeny 系统发育

☐☐☐ Describe the types of evidence that can be used to infer an evolutionary relationship.
☐☐☐ Explain how phylogenetic trees and cladograms can be used to infer evolutionary relatedness.

7.10 Speciation 物种形成

☐☐☐ Describe the conditions under which new species may arise.
☐☐☐ Describe the rate of evolution and speciation under different ecological conditions.
☐☐☐ Explain the processes and mechanisms that drive speciation.

7.11 Variations in Populations 群体中的变异

- ☐☐☐ Explain how the genetic diversity of a species or population affects its ability to withstand environmental pressures.

7.12 Origins of Life on Earth 地球生命的起源

- ☐☐☐ Describe the scientific evidence that supports models of the origin of life on Earth.

8. Ecology 生态学

8.1 Responses to the Environment 对环境的响应

- ☐☐☐ Explain how the behavioral and physiological response of an organism is related to changes in internal or external environment.
- ☐☐☐ Explain how the behavioral responses of organisms affect their overall fitness and may contribute to the success of a population.

8.2 Energy Flow Through Ecosystems 生态系统中的能量流动

- ☐☐☐ Describe the strategies organisms use to acquire and use energy.
- ☐☐☐ Explain how energy flows and matter cycles through trophic levels.
- ☐☐☐ Explain how changes in energy availability affect populations, communities, and ecosystems.
- ☐☐☐ Explain how the activities of autotrophs and heterotrophs enable the flow of energy within an ecosystem.

8.3 Population Ecology 种群生态学

- ☐☐☐ Describe factors that influence growth dynamics of populations.

8.4 Effect of Density on Populations 密度对种群的影响

- ☐☐☐ Explain how the density of a population affects and is determined by resource availability in the environment.

8.5 Community Ecology 群落生态学

- ☐☐☐ Describe the structure of a community according to its species composition and diversity.
- ☐☐☐ Explain how interactions within and among populations influence community structure.

8.6 Biodiversity 生物多样性

- ☐☐☐ Describe the relationship between ecosystem diversity and its resilience to changes in the environment.
- ☐☐☐ Explain how the addition or removal of any component of an ecosystem will affect its overall short-term and long-term structure.

8.7 Disruptions in Ecosystems 生态系统的干扰

- ☐☐☐ Explain the interaction between the environment and random or preexisting variations in populations.
- ☐☐☐ Explain how invasive species affect ecosystem dynamics.
- ☐☐☐ Describe human activities that lead to changes in ecosystem structure and dynamics.

☐☐☐ Explain how geological and meteorological activity leads to changes in ecosystem structure and dynamics.