Biology 2 Semester Review

Chapter 12 & 13—DNA, RNA & Protein Synthesis

12–2 DNA

Key Concepts

- Watson and Crick's model of DNA was a double helix, in which two strands were wound around each other.
- The clues in Franklin's X-ray pattern enabled Watson and Crick to build their model.
- The double-helix model explains Chargaff's rule of base pairing and how the two strands of DNA are held together.

Vocabulary

nucleotide
base pairing

12–3 DNA Replication

Key Concept

- During DNA replication, the DNA molecule separates into two strands, then produces two new complementary strands following the rules of base pairing. Each strand of the double helix of DNA serves as a template, or model, for the new strand.

Vocabulary

chromatin
replication
DNA polymerase

13–1 & 13-2 RNA and Protein Synthesis

Key Concepts

- There are three main types of RNA: messenger RNA, ribosomal RNA, and transfer RNA.
- During transcription, RNA polymerase binds to DNA and separates the DNA strands. RNA polymerase then uses one strand of DNA as a template from which nucleotides are assembled into a strand of RNA.
- During translation, the cell uses information from messenger RNA to produce proteins.

Vocabulary

gene
messenger RNA (mRNA)
ribosomal RNA (rRNA)
transfer RNA (tRNA)
transcription
RNA polymerase
codon
translation
anticodon

13–3 Mutations

Key Concept

- Mutations are changes in genetic material. Gene mutations result from changes in a single gene. Chromosomal mutations involve changes in whole chromosomes.

Vocabulary

mutation
point mutation
frameshift mutation
polyploidy

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Describe Watson and Crick's model of the DNA molecule.

What are the four kinds of bases found in DNA?

Where and in what form is eukaryotic DNA found?

List the three main types of RNA.

What happens during transcription?

What happens during translation?

Describe the three main differences between RNA and DNA.

What is a mutation?

What is the significance of mutations to living things?

Describe the components and structure of a DNA nucleotide.

What is meant by the term *base pairing*? How is base pairing involved in DNA replication?

Describe the appearance of DNA in a typical prokaryotic cell.

Explain the process of replication. When a DNA molecule is replicated, how do the new molecules relate to the original molecule?

What is a codon? What is an anticodon?

Explain why controlling the proteins in an organism controls the organism's characteristics.

Name two major types of mutations. What do they have in common? How are they different? Give an example of each.

Biology 2 Semester Review

Chapter 3 – The Biosphere

3–1 What Is Ecology?

Key Concepts

- To understand the various relationships within the biosphere, ecologists ask questions about events and organisms that range in complexity from a single individual to a population, community, ecosystem, or biome, or to the entire biosphere.
- Scientists conduct modern ecological research according to three basic approaches: observing, experimenting, and modeling. All of these approaches rely on the application of scientific methods to guide ecological inquiry.

Vocabulary

ecology
biosphere
species
population
community
ecosystem
biome

3–2 Energy, Producers & Consumers

Key Concepts

- Sunlight is the main energy source for life on Earth. In a few ecosystems, some organisms rely on the energy stored in inorganic chemical compounds.
- Energy flows through an ecosystem in one direction, from the sun or inorganic compounds to autotrophs (producers) and then to various heterotrophs (consumers).
- Only about 10 percent of the energy available within one trophic level is transferred to organisms at the next trophic level.

Vocabulary

autotroph
producer
photosynthesis
chemosynthesis
heterotroph
consumer
herbivore
carnivore
omnivore
decomposer
food chain
food web
trophic level
ecological pyramid

3–3 Energy Flow in Ecosystems

Key Concepts

- Unlike the one-way flow of energy, matter is recycled within and between ecosystems.
- Every living organism needs nutrients to grow and carry out essential life functions. Like water, nutrients are passed between organisms and the environment through biogeochemical cycles.

Vocabulary

biogeochemical cycle
transpiration
limiting nutrient
algal bloom

Biology 2 Semester Review

List the six different levels of organization that ecologists study, in order from smallest to largest.

What are the two main forms of energy that power living systems?

Briefly describe the flow of energy among organisms in an ecosystem.

What proportion of energy is transferred from one trophic level to the next in an ecosystem?

Explain the relationships in this food chain: omnivore, herbivore, and autotroph.

How does the way that matter flows through an ecosystem differ from the way that energy flows?

Why do living organisms need nutrients?

Explain how a nutrient can be a limiting factor in an ecosystem.

Chapter 4 – Ecosystems and Communities

4–1 Climate

Key Concepts	Vocabulary
• Carbon dioxide, methane, water vapor, and a few other atmospheric gases trap heat energy and maintain Earth's temperature range. • As a result of differences in latitude and thus the angle of heating, Earth has three main climate zones: polar, temperate, and tropical.	weather climate greenhouse effect polar zone microclimate tropical zone

4–2 & Sec 4-3 Niches & Community Interactions & Succession

Key Concepts	Vocabulary
• Together, biotic and abiotic factors determine the survival and growth of an organism and the productivity of the ecosystem in which the organism lives. • Community interactions, such as competition, predation, and various forms of symbiosis, can powerfully affect an ecosystem.	biotic factor abiotic factor habitat niche competitive exclusion principle predation symbiosis

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- Ecosystems are constantly changing in response to natural and human disturbances. As an ecosystem changes, older inhabitants gradually die out and new organisms move in, causing further changes in the community.

mutualism
commensalism
parasitism
ecological succession
primary succession
pioneer species
secondary succession

4–4 Biomes

Key Concept

Vocabulary

- The world's major biomes include tropical rain forest, tropical dry forest, tropical savanna, temperate grassland, desert, temperate woodland and shrubland, temperate forest, northwestern coniferous forest, boreal forest, and tundra. Each of these biomes is defined by a unique set of abiotic factors—particularly climate—and has a characteristic ecological community.

biome
tolerance
canopy
deciduous
coniferous
humus
taiga
permafrost

What is the greenhouse effect?

Describe Earth's three main climate zones.

What are the main factors that determine Earth's climate?

What is the difference between a biotic factor and an abiotic factor?

What is the difference between primary succession and secondary succession?.

How is an organism's niche determined?

List the major biomes, and give one characteristic feature of each.

How are biomes classified?

How might a mountain range affect the types of plants and animals found in an area?

Biology 2 Semester Review

Chapter 5 -- Populations

5–1 How Populations Grow

Key Concepts	Vocabulary
• Three important characteristics of a population are its geographic distribution, density, and growth rate. • Three factors affect population size: the number of births, the number of deaths, and the number of individuals that enter or leave the population. • Under ideal conditions and unlimited resources, a population will continue to grow in a pattern called exponential growth. As resources are used up and population growth slows or stops, the population exhibits logistic growth. •	population density immigration emigration exponential growth logistic growth carrying capacity

5–2 Limits to Growth

Key Concepts	Vocabulary
• Density-dependent limiting factors include competition, predation, parasitism, and disease. • Unusual weather, natural disasters, seasonal cycles, and certain human activities—such as damming rivers and clear-cutting forests—are all examples of density-independent limiting factors.	limiting factor density-dependent limiting factor predator-prey relationship density-independent limiting factor

5–3 Human Population Growth

Key Concepts	Vocabulary
• Like the populations of many other living organisms, the size of the human population tends to increase with time. • The characteristics of populations, and the social and economic factors that affect them, explain why some countries have high population growth rates while populations of other countries grow slowly or not at all.	demography demographic transition age-structure diagram

Biology 2 Semester Review

List three characteristics that are used to describe a population.

What factors can change a population's size?

What is the difference between exponential growth and logistic growth?

What is meant by population density?

Define carrying capacity.

What is the relationship between competition and population size?.

Identify how a limited resource can affect the size of a population. Give an example that illustrates this situation.

Describe the general trend of human population growth that has occurred over time.

What factors explain why populations in different countries grow at different rates?

What is demography?

Chapter 6 – Humans in the Biosphere

6–1 A Changing Landscape

Key Concept	Vocabulary
• Among human activities that affect the biosphere are hunting and gathering, agriculture, industry, and urban development.	agriculture monoculture green revolution

6–2 Using Resources Wisely

Key Concepts	Vocabulary
• Environmental goods and services may be classified as either renewable or nonrenewable. • Human activities can affect the quality and supply of renewable resources such as land, forests, fisheries, air, and fresh water.	renewable resource nonrenewable resource sustainable development soil erosion desertification deforestation smog pollutant acid rain

Biology 2 Semester Review

6–3 Biodiversity

Key Concepts	Vocabulary
• Biodiversity is one of Earth's greatest natural resources. Many species have provided us with foods, industrial products, and medicines—including painkillers, antibiotics, heart drugs, antidepressants, and anticancer drugs. • Human activity can reduce biodiversity by altering habitats, hunting species to extinction, introducing toxic compounds into food webs, and introducing foreign species to new environments. • Today, conservation efforts focus on protecting entire ecosystems as well as single species. Protecting an ecosystem will ensure that the natural habitats and interactions of many different species are preserved at the same time.	biodiversity ecosystem diversity species diversity genetic diversity extinction endangered species habitat fragmentation biological magnification invasive species conservation

6–4 Meeting Ecological Challenges

Key Concept	Vocabulary
• Researchers are gathering data to monitor and evaluate the effects of human activities on important systems in the biosphere. Two of these systems are the ozone layer high in the atmosphere and the global climate system.	ozone layer ecological footprint global warming

List three types of human activities that can affect the biosphere. For each activity, give one environmental cost and one benefit.

What did agriculture provide that changed the course of human history?

Identify two ways in which the Industrial Revolution has affected living things.

What is the difference between a renewable and a nonrenewable resource?

Identify two ways in which environmental resources are important to human health.

Why is biodiversity worth preserving?

List four activities that can threaten biodiversity.

Explain the relationship between habitat size and species diversity.

Biology 2 Semester Review

What are two major global changes affecting the biosphere today?

Why is the ozone layer important to living things?.

How could a worldwide increase in temperature affect organisms?

What actions can people take in their daily lives to make wise choices in the use and conservation of resources?

Chapter 16 -- Darwin's Theory of Evolution

16–1 Darwin's Voyage of Discovery

Key Concepts

- During his travels, Charles Darwin made numerous observations and collected evidence that led him to propose a revolutionary hypothesis about the way life changes over time.
- Darwin observed that the characteristics of many animals and plants varied noticeably among the different islands of the Galápagos.

Vocabulary

evolution
theory
fossil

16–2 Ideas That Shaped Darwin's Thinking

Key Concepts

- Hutton and Lyell helped scientists realize that Earth is many millions of years old, and the processes that changed Earth in the past are the same processes that operate in the present.
- Malthus reasoned that if the human population continued to grow unchecked, sooner or later there would be insufficient living space and food for everyone.

16–3 & 16-4 Darwin Presents His Case & Evidence of Evolution

Key Concepts

- In artificial selection, nature provides the variation among different organisms, and humans select those variations that they find useful.

Vocabulary

artificial selection
struggle for existence
fitness
adaptation

Biology 2 Semester Review

- Over time, natural selection results in changes in the inherited characteristics of a population. These changes increase a species' fitness in its environment.
- Darwin argued that living things have been evolving on Earth for millions of years. Evidence for this process could be found in the fossil record, the geographical distribution of living species, homologous structures of living organisms, and similarities in early development, or embryology.

survival of the fittest
natural selection
descent with modification
common descent
homologous structures
vestigial organ

What pattern did Darwin observe among organisms of the Galápagos Islands?

What did Darwin's travels reveal to him about the number and variety of living species?

What is evolution? Why is evolution referred to as a theory?

What is a fossil?

How did Hutton and Lyell describe geological change?

According to Malthus, what factors limited population growth

How is natural variation used in artificial selection?

How is natural selection related to a species' fitness?

What types of evidence did Darwin use to support his theory of change over time?

Chapter 19 – The History of Life

19–1 The Fossil Record

Key Concepts

- The fossil record provides evidence about the history of life on Earth. It also shows how different groups of organisms, including species, have changed over time.
- Relative dating allows paleontologists to estimate a fossil's age compared with that of other fossils.
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Vocabulary

paleontologist
fossil record
extinct
relative dating
index fossil
half-life
radioactive dating
geologic time scale

Biology 2 Semester Review

- In radioactive dating, scientists calculate the age of a sample based on the amount of remaining radioactive isotopes it contains.
- After Precambrian Time, the basic divisions of the geologic time scale are eras and periods.

era
period

Which type of dating provides an absolute age for a given fossil?

How are eras and periods related?

How do fossils form?

What geologic era is known as the Age of Mammals? When did this era begin?

What substances probably made up Earth's early atmosphere?

How did the addition of oxygen to Earth's atmosphere affect life of that time? .

Where did life exist during the early Paleozoic Era?

What are two key events from the Mesozoic Era?

What role have mass extinctions played in the history of life?

Chapter 18 – Classification

18–1 Finding Order in Diversity

Key Concepts

- To study the diversity of life, biologists use a classification system to name organisms and group them in a logical manner.
- In binomial nomenclature, each species is assigned a two-part scientific name.
- Linnaeus's hierarchical system of classification includes seven levels. They are—from smallest to largest—species, genus, family, order, class, phylum, and kingdom.

Vocabulary

taxonomy
binomial nomenclature
genus
taxon
family
order
class
phylum
kingdom

Biology 2 Semester Review

18–2 Modern Evolutionary Classification

Key Concepts	Vocabulary
• Organisms are now grouped into categories that represent lines of evolutionary descent, or phylogeny. • The genes of many organisms show important similarities at the molecular level. Similarities in DNA can be used to help determine classification and evolutionary relationships.	phylogeny evolutionary classification derived character cladogram molecular clock

18–3 Building the Tree of Life

Key Concepts	Vocabulary
• The six-kingdom system of classification includes the kingdoms Eubacteria, Archaebacteria, Protista, Fungi, Plantae, and Animalia. • The three domains are the domain Eukarya, which is composed of protists, fungi, plants, and animals; the domain Bacteria, which corresponds to the kingdom Eubacteria; and the domain Archaea, which corresponds to the kingdom Archaebacteria.	domain bacteria Eubacteria Archaea Archaebacteria Eukarya Protista Fungi Plantae Animalia

How are living things organized for study?

Describe the system for naming species that Linnaeus developed.

What are the seven taxonomic categories of Linnaeus's classification system? Rank these taxa in hierarchical order, beginning with the largest level and ending with the smallest.

Why do scientists avoid using common names when discussing organisms?

What is binomial nomenclature?

How is information about evolutionary, or phylogenetic, relationships useful in classification?

How are genes used to help scientists classify organisms?

What is the principle behind cladistic analysis?