

Astronomy 141 -- Winter 2012

Quiz 2 Study Guide

What is Life

Biological definition of life
 6 basic characteristics for life
 Order and Structure
 Reproduction and growth/development
 Energy utilization
 Response to environment
 Adaptation to environment by evolving
 Natural Selection

Cells

Cell membranes
 Carbon Chemistry - what makes carbon special
 Proteins and enzymes
 Amino Acids - only 22 in Earth life, all left-handed
 Chirality (handedness)
 Nucleic acids - RNA and DNA
 Prokaryotes
 Eukaryotes
 Phylogenetic Tree of Life
 Three Groupings: Bacteria, Archaea, and Eukarya

Chemistry of Life

Main elements: CHON plus sulfur (S) and phosphorus (P)
 Metabolism
 ATP cycle
 Sources of carbon: Autotrophs vs. Heterotrophs
 Sources of energy: chemical and sunlight
 Photosynthesis
 Chemosynthesis
 Crucial role of liquid water as the ideal solvent medium of biochemistry

DNA, RNA, and Heredity

Use of DNA to store and transmit cellular operating instructions
 DNA structure - sugar and phosphate backbone, 4 nucleotides base-pairs
 AT and GC
 Base pair sequences and how the code for amino acids for proteins
 Double-helix structure and replication
 RNA structure - sugar and phosphate backbone, AUGC pairs
 Role of RNA (transcription, translation, catalyze protein synthesis)
 Copying errors and mutations
 Mutations are molecular basis of evolution by providing genetic variation

Life on the Edge: Extremophiles

Main Types: thermophiles, psychrophiles, halophiles, acidophiles
 Thermophiles - why is heat bad, how have thermophiles adapted
 Environment of thermophiles, metabolism, first forms of life?
 Psychrophiles - why is cold bad, how have psychrophiles adapted
 Halophiles - why is salinity bad
 Acidophiles - why is acidity bad
 Radiation-resistant organisms
 Endoliths
 Life not possible without liquid water

Origin of Life on Earth

What are the requirements for life?
 What is Abiogenesis
 Miller-Urey Experiment
 Sources of Amino Acids
 Role of Lipid vesicles as proto-cell membranes
 RNA World model of life's origin
 Metabolism First model of life's origin

Earliest forms of Life

Challenges of finding the oldest fossils
 Stromatolites - fossil and present-day, oldest form of life
 Microfossils - fossil cells, challenges and oldest microfossils
 Carbon Isotope ratios - why a marker for life, challenges

Which came first, photosynthesis or chemosynthesis?

Were extremophiles the first forms of life?

History of Life on Earth

Proterozoic Eon - rise of oxygen, first eukaryotes
 Phanerozoic Eon - first multicellular animals.
 Cambrian Explosion of animal diversity
 Plants and fungi colonize land (why not earlier?)
 Animals colonize land
 Emergence of mammals and dinosaurs
 K-T event and rise of mammals
 Emergence of hominids and humans

Extinction and Impacts

Role of mass extinctions in the history of life
 The K-T (Cretaceous-Tertiary) event and death of dinosaurs
 What is the evidence that the K-T event was an asteroid impact?
 Other mass extinctions in geological history
 Current-day hazards from asteroidal impacts
 What was the Tunguska Event?