

Different DNA → Diff. RNA → diff. proteins → diff. traits

By analyzing DNA, you can find that

Analyzing DNA is one way to show common ancestry  
GEL Electrophoresis  
PCR Analysis

can be supported by Q27-31

18, 23 Organisms are linked by lines of descent from common ancestry

which demonstrates

48-51 Phylogenetic trees and cladograms are graphical representations of evolutionary history that can be tested.

supported by

Scientific Evidence from Fossil records many different disciplines supports S3 models of the origin of life

including

There are several hypotheses about the natural origin of life on Earth, each w/ supporting scientific evidence

**Big Idea 1:**  
The process of evolution drives the diversity and unity of life.

Examples: Cellular Respiration,

including

Organisms share many conserved core functions and processes and features that evolved and are widely distributed among organisms today  
S4

Speciation occurs from geographic isolation, reproductive isolation, environmental changes

caused by

Speciation and extinction have occurred throughout Earth's history

supported by

example of extinction would be extinction of dinosaurs

occurring due to

Speciation may occur when two populations become reproductively isolated from each other.  
Darwin and the Galapagos Finches

Change in the genetic makeup of a population over time is evolution.

supported by

Biological Evolution is supported by scientific evidence from many disciplines including mathematics

which also shows

Evolutionary change is also driven by random processes changes allow

Life continues to evolve within a changing environment

allowing

Populations of organisms continue to evolve

Examples: Hardy-Weinberg Equilibrium and Chi-Square Analysis  
Q40, 121  
demonstrated by

Mutations = Random  
There are multiple mutations that may make an individual lactose intolerant.  
Sickle cell anemia prevents individuals from acquiring HIV.  
evidence includes

The origin of living systems is explained by natural processes.

which shows

Natural selection is a major mechanism of evolution  
Q 23, 24, 33, 124

affecting

Natural Selection acts on phenotypic variations in populations (traits)  
Rock pocket mice

which supports the idea that

Natural Selection allows favorable genes to become more prevalent as more offspring from "fit" parents are produced.  
sticklebacks  
Antifreeze gene

of a biological system are influenced by changes in the system's environment  
↓ change in environment leads to

Timing and coordination of behavior are regulated by various mechanisms and are important in natural selection  
↓ also

Timing and coordination of physiological events are regulated by multiple mechanisms.  
↓ this includes

Timing and coordination of specific events are necessary for the normal development of an organism, and those events are regulated by a variety of mechanisms  
2014 #35

Organisms respond to change in their external environments

affected by

Biological Systems are affected by disruptions to their dynamic homeostasis

organisms use feedback mechanisms to maintain their internal env. and respond to external env. changes  
2014 #1

Positive Negative Feedback

affected by

All biological systems from cells and organisms to populations, communities and ecosystems are affected by complex biotic and abiotic interactions involving exchange of matter and free energy. 2013 p.2 #4

Biotic Abiotic

Organisms must exchange matter w/ the env. to grow, reproduce & maintain organization  
2013 #28  
42-45

Cell Membranes are selectively permeable due to their structure and put into...  
Eukaryotic cells maintain internal membranes that partition the cell into specialized regions

Growth, reproduction and maintenance of the organization of living systems need free energy and matter  
↓ molecules need ↑ energy to move  
Growth and Dynamic homeostasis are maintained by the constant movement of molecules across membranes.  
↓ includes

Growth, reproduction and dynamic homeostasis require that cells create and maintain internal env. that are different from their external env.  
↓ by using

Organisms also use feedback mechanisms to regulate growth and reproduction, and to maintain dynamic homeostasis.  
↓ examples

Many biological processes involved in growth, repair, and dynamic homeostasis include temporal regulation & coordination

Plants & Animals have a variety of chemical defenses against infections that affect dynamic homeostasis

caused by

# Concept Map

The inheritance pattern of many traits cannot be explained by simple Mendelian genetics.

↓ important since heritable information provides for continuity of life.

↓ transferred by In eukaryotes, heritable information is passed to the next generation via processes that include the cell cycle and mitosis or meiosis plus fertilization.

↓ in DNA, and in some cases RNA, is the primary source of heritable information.

↓ involving Expression of genetic information involves cellular and molecular mechanisms.

↓ processes Biological systems have multiple processes that increase genetic variation.

↓ through Living systems store, retrieve, transmit, and respond to information essential to life processes.

↓ communicate Cell communication processes share common features that reflect a shared evolutionary history.

↓ how Cells communicate with each other through direct contact with other cells or from a distance via chemical signaling.

↓ by Animals have nervous systems that detect external and internal signals, transmit and integrate information, and produce responses.

Individuals can act on information and communicate it to others.

↓ Signal transduction pathways link signal reception with cellular response.

↓ Changes in signal transduction pathways can alter cellular response.

↓ The processing of genetic information is imperfect and is a source of genetic variation.

↓ A variety of intercellular and intracellular signal transmissions mediate gene expression.

↓ effects changes in genotype can result in changes in phenotype

↓ Gene regulation results in differential gene expression, leading to cell specialization.

↓ cells communicate by generating, transmitting and receiving chemical signals.

↓ Transmission of information results in changes within and between biological systems.

→ Viral replication results in genetic variation, and viral infection can introduce genetic variation into the hosts.

↓ The chromosomal basis of inheritance provides an understanding of the pattern of passage (transmission) of genes from parent to offspring.

↓ Heritable information is passed down from one generation to the next. Transmissions through signals mediate gene expression which is explained in the chromosomal basis of inheritance.

2013

#6, 15, 18,

25, 26, 30,

31, 32, 38,

46, 48, 124,

FR#5

2014

#6, 21, 29-32,

33, 37, 50,

52

FR#2, 3, 6



# Big Idea 4: Biological systems interact, and these systems and their interactions possess complex properties.

Subcomponents of Biological molecules + their sequence determine the properties of that molecule

The structure + function of subcellular components and their interactions provide essential cellular processes

interactions between molecules affect their structure + function

interactions within biological systems lead to complex properties

interactions among living systems + with their environment result in the movement of matter + energy

organisms exhibit complex properties due to interactions between their constituent parts.

- | 2013    | 2014   |
|---------|--------|
| • 4     | • 1    |
| • 8     | • 5    |
| • 10-13 | • 6-10 |
| • 14    | • 11   |
| • 20-22 | • 14   |
| • 23    | • 21   |
| • 24    | • 25   |
| • 37    | • 45   |

2014: 21  
variation in molecular units provides cells with a wider range of functions

The level of variation in a population affects population dynamics

2013: 4, 23, 2014: 1, 5, 14  
Environmental factors influence the expression of the genotype in an organism.

2013: 8  
Naturally occurring diversity among and between components within biological systems affect interaction with the environment

2013: 8  
The diversity of species within an ecosystem may influence the stability of the ecosystem

2014: 11  
Distribution of local + global ecosystems changes over time

2013: 10-13, 2014: 45  
communities are composed of populations of organisms that interact in complex ways

2013: 10-13, 2014: 45  
competition + cooperation are important aspects of biological systems

2013: 24  
interactions between + within populations influence patterns of species distribution + abundance.

2013: 37, 2014: 6-10  
cooperative interactions within organisms provide efficiency in the use of energy + matter.

## Class Activities

- Organelle Project
- Dust Bowl Project
- POGIL: Interactions
- POGIL Gene Expression