

2008, 2009, 2010, 2011, 2012, 2013 REVIEW FOR Bio LE REGENTS by Nedwidek,
typed by Karen Luo, Stuy Class of 2011!

LIVING ENVIRONMENT REGENTS IS TUESDAY JUNE 11, 2013 FROM 12:30pm-4pm

ROOMS TBA, I promise!

Go to www.nysed.gov to view the actual syllabus, which I also am posting. Know content from these two standards. Please also see posted lab cribs for fall and spring!!

Standard 1: Scientific Inquiry Standard 4: Key Ideas on content

Standard I: Scientific Inquiry

-  Explanations combine evidence with prior knowledge.
-  Judgments + validity/reliability are important.
-  Observations lead to predictions
-  Explanations are subject to change.
-  Theories are formed by interpreting large bodies of evidence
-  Hypotheses are predictions that inform data collection
-  Research plans should articulate trials, sample size, objective, data collection
-  Data interpretation leads to new hypotheses.
-  Factors like small sample size, inadequate controls, misleading use of numbers should lead one to question a claim

Standard IV: Key Idea I: Living vs. Nonliving things

-  Food webs are an important part of ecosystem- disruptions in them can alter ecosystem stability/ remove vital resources
-  Organism interdependence results in stability.
-  Scale/ Organization: Virus→ Bacterium→ Organelle→ Cell→ tissue→ organ→ organ system→ whole organism
-  Important system: endocrine, digestion, respiration, reproduction, circulation, excretion, movement/coordination, immunity: all interact
-  Homeostasis is the most important control mechanism for maintaining system function/stability in organisms
-  Important organelles: cytoplasm, mitochondria, ribosomes, cell membrane, vacuole, nucleus
-  About membranes: know selective permeability, passive and active transport, osmosis (Diffusion of H₂O)
-  Receptors respond to hormones; both involved in cell communication
-  One celled organisms have special structure: maintain homeostasis

Key Idea 2: Inheritance and Reproduction

-  Genes are inherited or passed down
-  Information is transferred from one generation to next
-  Human traits are controlled by one or many genes- (nucleus has thousands)
-  Know difference between: sexual/asexual reproduction, organisms that do each

- 🍌 Variation is a function of mutation, recombination and sex.
- 🍌 Sexual reproduction: 2 haploid(1n) genomes unite to form a diploid (2n) zygote
- 🍌 DNA code: A, G, C, T: string of bases encodes genes, which form the basis for protein sequence/structure
- 🍌 Cells store information
- 🍌 Genes are segments of DNA
- 🍌 Folded proteins (or enzymes) structure determines function
- 🍌 Offspring inherit genes
- 🍌 Environment and history can determine development
- 🍌 Genotype informs phenotype
- 🍌 When cells differentiate, controlled by different genes being expressed in each cell
- 🍌 Genetic engineering/breeding is selective
- 🍌 Breeding can be used to manipulate characteristics
- 🍌 Enzymes cut, copy and move DNA to make recombinants
- 🍌 Inserted, deleted, and substituted DNA alters genes.
- 🍌 An altered gene can be passed to every cell that develops after change
- 🍌 Health care/ agriculture/ disease cures all depend on genetic engineering

Key Idea III: Evolution and Speciation

- 🐼 Earth's species evolved from earlier, different species
- 🐼 New characteristics result from new gene combinations
- 🐼 Mutation and sorting at meiosis makes gene combos that are passed on to offspring
- 🐼 Evolution results from potential for population change, variability, carrying capacity, and selection- acting together
- 🐼 Natural selection explains changes in life forms over time
- 🐼 Adaptive advantage drives speciation
- 🐼 Behavior is the result of natural selection
- 🐼 All life emerged from one cell, about a billions years ago
- 🐼 The directionality of evolution is not pre-set.
- 🐼 Extinction occurs when environment changes, and species cannot adapt

Key Idea IV: Reproduction and Development

- 🐘 Reproduction and development are necessary to continue a species
- 🐘 Asexual and sexual reproduction; cloning is asexual
- 🐘 Meiosis reduces the diploid number to 1n. Fertilization restores, forms a zygote
- 🐘 Differentiation is a mitotic process
- 🐘 Human reproduction and development are influenced by gene expression, hormones and environment
- 🐘 Important hormones = testosterone, estrogen, progesterone
- 🐘 Structures and functions- know differences b/w functions of: ovaries, uterus, placenta (in females) and testes, penis (in male).
- 🐘 Embryonic development; most important= trimester one- drugs are toxic at this stage

Key Idea V: Equilibrium and Homeostasis; Disease

- 🌱 Energy for life comes from the sun. Photosynthesis connects the sun and life energy

- 🌱 Plant cells have chloroplast- the site of photosynthesis where water is split to power conversion of CO₂ to glucose sugar
- 🌱 Organic compounds are used to assemble DNA, starch, fats, and proteins. Chemical energy powers life processes.
- 🌱 The release of energy during cell respiration (which forms lots of ATP in present of O₂) is accompanied by CO₂ and H₂O release.
- 🌱 ATP energy is used to obtain and transport material; eliminate waste
- 🌱 Biological processes are controlled by enzymes which are expressed by genes.
Enzymes catalyze, or increase rate of chemical reactions
- 🌱 Reaction rate is controlled by pH, temperature, etc. : environment
- 🌱 Enzymes and receptors have shape(structure) that imparts function
- 🌱 Homeostasis perturbations can result in disease or death
- 🌱 Pathogen infections affect homeostasis
- 🌱 The immune system protects against foreign antigens by making antibodies
- 🌱 White blood cells “remember” invaders to fight future similar infections
- 🌱 Vaccinations “teach” the immune system what to react to.
- 🌱 HIV/AIDS cripples the immune system (Tcells) and allows secondary infection
- 🌱 Allergies are unnecessary reactions to harmless antigens
- 🌱 Disease can be inherited or due to toxins, poor nutrition, organ malfunction and some types of personal behavior/ activity
- 🌱 Gene mutations in a somatic cell leads to cancers, which can be induced by radiation and chemicals
- 🌱 Organisms respond to environmental stimuli
- 🌱 Feedback mechanisms maintain homeostasis: insulin, glucagons (pancreas), TSH/thyroxine(thyroid), stomata responses (plants)

Key Idea VI: Environmental Interactions

- ☀️ Energy flows from sun to photosynthetic organisms to herbivores, then carnivores, then decomposers
- ☀️ Sunlight powers energy input, but ultimately decomposers release usable biomolecular back into the environment
- ☀️ C, H, N, O: Different combinations are assembled in food webs.
- ☀️ Energy is release as you move farther away from the producer organism in a food web which is not the same as either a food chain or succession.
- ☀️ Carrying capacity is limited by many abiotic factors like energy, water, oxygen, and minerals, as well as biotic factors like population size and recycling of dead organisms by bacteria and fungi
- ☀️ Growth and survival depend on physical conditions such as availability of light, temperature, minerals, rocks, pH
- ☀️ Populations can potentially be unlimited in size. Resources are usually finite in ecosystems- competition ensues relationships b/w organisms: negative (parasitism), neutral (commensalism), and positive (mutualism).
- ☀️ Know producer/ consumer, predator/prey, and parasite/host. Also scavengers and decomposers

- 🌻 Biodiversity ensures species survival, driven by evolution. This increases ecosystem stability.
- 🌻 Ecological succession (primary) communities change over time starting with a pioneer (ex: lichen), climax with deciduous trees.
- 🌻 Organisms and accidents can alter stable ecosystems which build back by secondary succession.

Key Idea VII: Human Impact on the Environment

- 🐝 Earth has finite resources, many cannot be renewed
- 🐝 Atmospheric quality, soil quality, water cycling, waste removal, energy flow, nutrient cycling are all important.
- 🐝 Humans can destroy ecosystems by perturbing the equilibrium or the system- examples are population overgrowth, land overuse, habitat destruction, pollution, deforestation. Humans “insult” reduces or eliminates biodiversity.
- 🐝 Industrialization promotes usage of fossil and nuclear fuel.
- 🐝 Fossil fuels pump CO₂ into environment, promoting global climate change.
- 🐝 Global warming is primarily the result of excess environmental CO₂, amplifying infrared heat on water, land.
- 🐝 Ozone thinning is primarily the result of CFC release, promoting excess UV radiation on Earth
- 🐝 Personal responsibility- cost/ risk/ benefit. People need to make decisions to reverse trends in climate A.
- 🐝 Generational awareness. Future residents take care of planet.

Appendix A: Scientific Skills

- 🧐🌍 State Labs (4): MUST KNOW THEM!!!
- 🧐🌍 Diffusion and osmosis- observations and conclusion
- 🧐🌍 Making connections: data processing and collection
- 🧐🌍 Relationships and biodiversity: biotechnology and the environment
- 🧐🌍 Bird (Finch) beak: Natural selection and competition (results and ideas of each)