Environmental Science SGO Post-Test Review Packet

Chapter 1

NATURE OF SCIENCE

A. Terms:

1. **Observation:** What is seen or measured.

2. Inference: A conclusion based on observation or evidence.

3. **Hypothesis:** An untested prediction. A good hypothesis states both cause and effect ("If-then" statement).

4. **Theory:** A broad explanation of natural events that is supported by strong evidence.

B. Graphing

C. **Controlled Experiment:** Compares the results of an experiment between two (or more) groups.

1. **Experimental group:** Group being tested or receiving treatment. (ex: new drug)

2. **Control group:** "Normal" group. Should be identical to experimental group in every way except one: it does not receive the treatment (i.e.: no drug, or given the original drug or a placebo).

3. **Independent Variable:** Variable that is being tested; the variable the experimenter is manipulating (ex: new drug). In a graph the independent variable is always plotted on the X-axis.

4. **Dependent Variable**: Variable that is measured at the end of an experiment; the results (ex: does patient get better?) The dependent variable is always plotted on the Y-axis.)

5. **Control Variable:** Variable that stays the same or constant throughout the experiment (the same in both the experimental and control group).

D. Characteristics of a good experiment.

1. Can be repeated by anyone and get the same results.

2. Have large sample size/many test subjects.

3. Are performed for longer periods of time.

4. Test only one variable.

5. Are peer reviewed – examined by several scientists to determine its accuracy.

6. Does not have to agree with the hypothesis. A scientist's guess is allowed to be incorrect – and usually is.

7. Is objective – the experiment and conclusion are fair and unbiased. Fact and opinion are not mixed.

EXAMPLE OF EXPERIMENT

A scientist is testing the effect of temperature on the growth of a common houseplant. The scientist believes that higher temperatures will result in an increase in growth of the plant.

Hypothesis: If the temperature is increased, the growth of the houseplant will increase because higher temperatures are required for the plant enzymes to function correctly.

Independent Variable: The temperature the houseplant is placed in (Scientist is manipulating the temperature of the room the plant is in.)

Dependent Variable: The growth of the houseplant as measured by its height (Scientist is measuring the height of the plant.)

Control Variables: Type of plant, amount of water plant receives, amount of sunlight plant receives, location of plant, and amount of nutrients (Scientist is keeping all these factors the same in all groups of plants.)

Control Group	Experimental Group(s)
House plants found at normal temperature	Group 1: Plants found at 20 deg. C
(room temperature)	Group 2: Plants found at 30 deg. C
	Group 3: Plants found at 40 deg. C
	Group 4 Plants found at 50 deg. C

Chapter 3

- Atoms are the basic unit of matter
 - Nucleus: Contains protons and neutrons
 - Electrons: Move around the nucleus.
- Atoms can combine by sharing or transferring electrons to form **compounds**



- Organic compounds: Compounds with <u>carbon-to carbon</u> bonds. Living things are made of organic compounds
 - **O** Lipids
 - O Sugar
 - Ethanol
- <u>Inorganic</u> compounds: Lack carbon-to-carbon bonds

Macromolecules	Function	Basic Unit	Examples
Lipids:	Many functions:	Fatty acid	Fats, waxes,
	long-term energy		hormones
	storage (provides		
	greatest amount of		
	energy)		
Proteins:	Serve many	Amino acids	Amylase
	functions; include		
	enzymes		
Nucleic Acids	Direct protein	Nucleotide	DNA and RNA
	production		
Carbohydrates	Provides short-term	Monosaccharide	Glucose, starch
	energy and structure		

ACIDS, BASES, and pH

1. The separation of water molecules into ions causes solutions to be acidic, basic, or neutral.

2. The pH scale measures how acidic or basic a solution is.

- pH of 7—Neutral: Equal concentrations of H⁺ and OH⁻
- pH below 7—Acidic: Relatively high concentration of H⁺
- <u>pH above 7—Basic:</u> Relatively high concentration of OH⁻





Sources of carbon:

- Cellular respiration
- **O** Burning of fossil fuels
- Exhaust from automobiles and factories



Photosynthesis is carried out by plants, alga and blue-green bacteria (autotrophs). It takes the radiant energy of the sun and puts it in the bonds of sugar molecules. Photosynthesis occurs mostly in the chloroplast of plant cells.

- *Materials needed for photosynthesis*: carbon dioxide (CO_2), water, and energy from the sun
- *Products of photosynthesis:* sugar molecules (glucose) and oxygen
- ONLY PRODUCERS (AUTOTROPHS) UNDERGO PHOTOSYNTHESIS

Cellular Respiration: Organisms get energy by breaking the bonds of sugar molecules. The released energy is used to make a molecule of ATP, which gives all organisms their energy.

- *Materials needed for cellular respiration:* sugar and oxygen
- Products of cellular respiration: energy, carbon dioxide, and water
- CONSUMERS and PRODUCERS UNDERGO CELLULAR RESPIRATION



Photosynthesis and Aerobic Respiration are <u>opposite reactions</u>! They are also important in cycling oxygen, carbon, hydrogen and water through the environment.

Chapter 4



Ecosystem *includes all of the living things and their physical environments within a particular area.*

Abiotic factors are parts of an ecosystem that have never been living.
 Example: sunlight, water, air, rocks
 Biotic factors are parts of an ecosystem that are living or used to be living.
 Example: rotting tree, plants, bacteria, squirrels



Chapter 5

EVOLUTION

A. Basically states that modern species evolved from earlier, different species and share a common ancestor.

Main Mechanisms of Biological Evolution

1. Mutations	 Mutations are changes in DNA Gives rise to variation among individuals May be passed onto the next generation of offspring if mutation occurs in egg cell or sperm cell
2. Migration	 Immigration or emigration can cause a change in a population's gene pool. This process is called gene flow.
3. Genetic Drift	 Caused by an unusual event that Happens by chance <i>Kills</i> or <i>somehow separates</i> all except a few individuals in a population
4. Natural	• Process by which traits that improve an organism's

Selection**	chances for survival and reproduction are passed
	on more frequently to future generations than those that do not

B.** Charles Darwin proposed that **natural selection** is the mechanism that causes species to change. The requirements in natural selection are:

- 1. Overproduction of offspring.
- 2. Competition for limited resources.
- 3. Survival and reproduction OR death.
- 4. Individuals vary in characteristics, some of which are heritable.
- 5. Individuals vary in fitness, or reproductive success.

C. Organisms that are better adapted to their environment and able to reproduce successfully are considered "fit". Unfit organisms die, and their traits are eventually removed from the gene pool.

NOTE: Evolutionary fitness has nothing to do with physical fitness. Stronger is not always better.

D. Evolution is usually driven by a change in the environment.

E. To evolve, variations must exist in a species BEFORE the environment changes. <u>They do not get a trait just because it is needed.</u>

F. Variations exist primarily as the result of sexual reproduction and mutation.

G. Species with more variation are better able to survive environmental changes. Adaptations are heritable traits (can be passed onto offspring) that increases an individual organism's fitness.

H. Gradualism is a theory that says change occurs slowly. Punctuated equilibrium is a theory that says evolution happens in quick spurts.

I. Creation of new species usually requires geographic isolation, which eventually results in reproductive isolation.

J. **Evidence in support of evolution** comes from the fields of geology (fossil record and radioactive dating), genetics, biochemistry, anatomy and embryology (among others).

- *Fossil Evidence* shows structures of older organisms. They show the history of life on earth and how different groups of organisms have changed over time.
- *Similarity in DNA* shows the relationship between species (most convincing piece of evidence)

• *Embryological Development*: In their early stages of development, chickens, turtles and rats look similar, providing evidence that they shared a common ancestry.

Galapagos Finches eventually developed different sized and shaped beaks depending on the food commonly found in the island they lived on.



SPECIATION

1 Single population	Individuals mate with one another and share genetic information.
Constraints isolated populations	If populations are somehow broken into smaller populations that are isolated, individuals from one population cannot mate with individuals populations in another.
3 Divergence due to long-term geographical isolation	 Mutations can occur and over time genetic divergence occurs. Genetic divergence means that different populations develops its own set of mutations.
A Isolated populations come together; two populations can no longer interbreed and are now two species	Each population becomes so different that the two populations no longer interbreed.

EXTINCTION

- The disappearance of species from Earth
- Generally occurs gradually, one species at a time, when environmental conditions change more rapidly than the species can adapt
- Possible causes of extinction:
 - 1. Destruction caused by humans
 - 2. Introducing invasive species
 - 3. Natural disasters
 - 4. Removal of keystone species in an ecosystem

ECOLOGICAL RELATIONSHIPS

A. Understand how organisms interact with their environment (food webs, nutrient cycles).



- Food chain: Linear series of feeding relationships
- Food web: Shows the overlapping and interconnected food chains present in a community

SPECIES INTERACTIONS

Interaction	Effect on Species	Effect on Species	Description
	A	B	
Commensalism	+	0	One species
			benefits while
			the other is not
			affected
Competition	-	-	Species are
			competing for
			the same
			resource
Mutualism	+	+	Both species
			benefit
Parasitism	+	-	One species
			benefits while
			the other is
			harmed
Predation	+	-	One species is
			hunted while
			the other hunts

B. **Energy** is needed to keep an ecosystem going. The energy comes from the sun and is made usable by **producers** (plants and other autotrophs). They create their own food through photosynthesis.

C. Energy is passed on to other organisms in the form of food. Since all organisms must use energy for their own needs, most energy is lost before it can be passed to the next step in the food chain. As a result, organisms high on the food chain have less energy available to them and must have smaller populations.

 Consumers rely on other organis Use oxygen to break respiration (primary 1) 	<i>ms for energy and nutrients</i> bonds in sugar and release its energy through cellular producers do this, too)	
Herbivores	<i>Eat plants</i>	
Carnivores	Eat meat	
Omnivores	Eat both plants and meat	
Detritivores	<i>Eat dead bodies; scavengers. Helps recycle nutrients</i>	
	within an ecosystem	
Decomposers	Breaks down nonliving matter. Helps recycle	
	nutrients within an ecosystem	



- An organism's rank in a feeding hierarchy is its trophic level.
- **Primary producers** always occupy the first trophic level of any community.
- In general, only about **10% of the energy** available at any trophic level is passed to the next; most of the rest is lost to the environment as heat.

E. There are many roles in an ecosystem (niche), but competition between species usually results in only one species occupying a niche at any one time. Often, organisms with similar needs will divide resources.

ECOLOGICAL SUCCESSION

Ecological succession *is the predictable series of changes over time that happen after a disturbance, like fire, in a community.*

Primary	Secondary
Occurs when there are <u>no traces</u> of the	Occurs when a disturbance dramatically
original community remaining, including	alters a community but <u>does not completely</u>
vegetation and soil	destroy it
Time 15 years 35 years 15 years	Jyears Syears 40+ years

Chapter 7

BIODIVERSITY

Biodiversity *refers to the variety of life on earth.*

- Includes three types:
 - Genetic diversity: Differences in DNA among individuals
 - Species diversity: Variety of species in a given area
 - Ecosystem diversity: Variety of habitats, ecosystems, communities



Loss of Biodiversity

- Habitat change and loss
- Invasive species
- Pollution
- Overharvesting

As habitats are lost and species become extinct, biodiversity is reduced. This is bad because 1) ecosystems with low diversity take longer to recover from

environmental changes and 2) we use organisms for many things such as food and medicine; by reducing biodiversity we are losing potentially valuable resources.

Protecting Biodiversity

- *Laws* that make destruction and hunting of endangered species illegal
- *Captive Breeding:* Raising and breeding organisms in controlled conditions, such as zoos or aquariums
- *Cloning* allows scientists to duplicate endangered species.

Chapter 11

Clear Cutting	Shallarran d/Saad Traa	Calcation Crustom
Clear Cutting	Shelterwood/Seed Tree	Selection System
 Involves cutting down all trees in a region, resulting in even-aged stands of regrowth Changes abiotic conditions (light penetration, precipitation, wind, and temperature) Benefit: Cost efficient Costs: Entire communities usually displaced or destroyed; causes soil erosion 	 Seed-tree: Small numbers of mature, healthy trees are left standing, to reseed the area. Shelterwood: Involves leaving a few mature trees standing to provide shelter for seedlings Benefit: Less damaging than clear-cutting Cost: As with clear- cutting, leads to mostly even-aged regrowth 	 Relatively few trees are cut at once under a selection system. Selection can involve widely spaced single trees or groups. <u>Benefits:</u> More biodiverse, uneven-aged growth Less overall environmental damage <u>Costs:</u> Machinery disturbs forest interior. Expensive More dangerous for loggers

METHODS OF TIMBER HARVESTING (Ways of Cutting Down Trees)



Chapter 13

GENETICALLY MODIFIED ORGANISMS

Scientists can change the DNA of an organism through genetic engineering. Organisms that have had their DNA changed are called *genetically modified organisms*.

To create a Genetically Modified Organism:

1. A scientist must find genes that code for GOOD TRAITS (resistance to pesticides, creates a pesticide, pest resistance, cold tolerance, and etc.) from an organism

2. The scientist will take them from the organism with the GOOD TRAITS

3. The scientist will put the GOOD GENES in a bacteria or virus

4. The scientist will introduce the bacteria or virus with the GOOD GENES and inject them into the organism they want to modify



Pros	Cons
1. More efficient production of food	1. Food may not be healthy to eat
2. Helps fruits and vegetables "last longer"	2. Pests would evolve resistance to pest- resistant crops and become "superpests"
3. Less pesticides needed and less fuel	2 Construite Madified Construite
needed for equipment that apply pesticides	"escape" and spread to other organisms

Pros and Cons of GMOs

INDUSTRIAL FOOD PRODUCTION

Feedlots, aquaculture, and other methods of industrial food production are efficient, but they have disadvantages.

It requires more feed input to produce a kilogram of meat than it does to produce a kilogram of eggs or milk. The production of meat for food is extremely in efficient.





Parts of the Earth

GEOSPHERE = lithosphere, hydrosphere, atmosphere



CONVECTION



Studying Strategies

1. Outlining/rewriting your notes.

2. *Explaining* a concept to a classmate or family member.

3. Creating *possible questions* you may be asked about and having a classmate answer them.

4. Flashcards.

5. *Drawing diagrams* to show relationships between concepts and topics.

6. Video Tutorials on the following websites:

- <u>www.youtube.com</u>
- <u>www.khanacademy.org</u>

7. Quizlet (online flashcards). (<u>www.quizlet.com</u>)

8. Creating *mnemonics*, or something that helps you remember.

(For example, to help you remember the colors of the rainbow: ROYGBIV R = red, O = orange, Y = yellow, etc...)

9. Creating a *cheat sheet* that contains only the most important concepts and details. (Of course, don't count on that cheat sheet on being there for the actual exam!)

Exam Taking Tips

1) Draw diagrams to help you visualize the questions asked - where possible.

2) Read introductory paragraphs and study diagrams before looking at questions. Underline key words. Read all choices before deciding on an answer, sometimes a question has a good and a better answer. Always choose the best answer.

3) If you are not sure of an answer, try to eliminate choices that you think are clearly wrong and narrow down your choices. Then make your most careful guess.

4) Skip over hard questions that are stumping you. Go back to them later. Something else in the test may give you a clue to the harder problems.

5) Don't leave any questions blank. Check your test a second time, but only change an answer if you find an obvious mistake. Your first choice is usually correct.

6) Take your time.

7) Have a healthy meal for breakfast the morning of and a good night sleep is as important as the above items.

Practice Questions

1. An ecosystem is represented below. This ecosystem will be self-sustaining if



- A. the organisms labeled A outnumber the organisms labeled B
- B. the organisms labeled A are equal in number to the organisms labeled B
- C. the type of organisms represented by B are eliminated
- D. materials cycle between the organisms labeled A and the organisms labeled B

2. According to Darwin's theory of evolution, differences between species may be the result of

- A. the disuse of body structures
- B. the transmission of acquired characteristics
- C. natural selection
- D. mutagenic agents

3. Which concept was not included in Charles Darwin's theory of natural selection?

- A. survival of the fittest
- B. struggle for existence
- C. overproduction of offspring
- D. punctuated equilibrium

4. Mutations can be considered as one of the raw materials of evolution because they

- A. contribute to new variations in organisms
- B. are usually related to the environment in which they appear
- C. are usually beneficial to the organism in which they appear
- D. usually cause species of organisms to become extinct

All of Earth's water, land, and atmosphere within which life exists is known as

- 1. a population
- 2. a community

- 3. a biome
- 4. the biosphere

Which statement best describes some organisms in the food web shown below?



- 1. Minnows and fish are primary consumers.
- 2. Algae and floating plants are decomposers.
- 3. Aquatic crustaceans are omnivores.
- 4. Raccoons, fish, and ducks are secondary consumers.

Most autotrophs store energy in the form of

- 1. starches
- 2. carbon dioxide
- 3. water
- 4. nucleic acids

The timber wolves, rabbits, and vegetation in a particular region of northern New York together constitute part of a

- 1. population
- 2. community
- 3. genus
- 4. species

A rocky island appears as oceanic waters recede. Which of the following forms of vegetation would probably appear first on the bare rocks?

- 1. lichens
- 2. weeds
- 3. shrubs
- 4. pioneer trees

After a building was torn down and the area v cleared, grasses began to grow in the ar-Several years later, small bushes replaced t grasses. This pattern of plant growth is known ecological

- (1) stability
- (3) succession
- (2) cultivation
- (4) coordination

A human activity that could significantly *decreas* the amount of carbon dioxide in the air is

- (1) increasing the use of fossil fuel
- (2) controlling insect pests that eat stored grain
- (3) burning garbage and trash to generat electricity
- (4) preserving and expanding forest habitats the shelter wildlife

The wetland plant purple loosestrife w imported to North America from Europe. Sin its introduction, the loosestrife has sprea which has resulted in a dramatic decline in t biological diversity of native wetland plants. likely reason for the spread of the purp loosestrife is that it can

- (1) successfully compete with native herbivor for food
- (2) serve as an excellent food source for nati herbivores
- (3) successfully compete with native plants for spa
- (4) prevent the migration of native plants

The diagram below represents a food web.



Which statement regarding organisms in this food web is correct?

- (1) There would be more snakes than pocket gophers.
- (2) There would be more coyotes than rabbits.
- (3) There would be more insects than insecteating birds.
- (4) There would be more hawks than seedeating birds.
- 9 Some farmers currently grow genetically engineered crops. An argument *against* the use of this technology is that
 - (1) it increases crop production
- (2) it produces insect-resistant plants
- (3) its long-term effects on humans are still being investigated
- (4) it always results in crops that do not taste good

FOR REVIEW GAMES, VISIT:

http://reviewgamezone.com/topics.php?id=24&name=Environmental%20Science

Growers of fruit trees have always had problems with insects. Insects can cause visible damage to fruits, making them less appealing to consumers. As a result of this damage, much of the fruit cannot be sold. Insecticides have been useful for controlling these insects, but, in recent years, some insecticides have been much less effective. In some cases, insecticides do nothing to stop the insect attacks.

Provide a biological explanation for this loss of effectiveness of the insecticides. In your answer, be sure to:

- identify the original event that resulted in the evolution of insecticide resistance in some insects [1]
- explain why the percentage of resistant insects in the population has increased [1]
- describe *one* alternative form of insect control, other than using a different insecticide, that fruit growers could use to protect their crops from insect attack [1]

A graph of the population growth of two different species is shown below.



Which conclusion can be drawn from information in the graph?

- (1) Oxygen concentration affects population sizes of different species in the same manner.
- (2) Species A requires a high oxygen concentration for maximum population growth.
- (3) Species B requires a high oxygen concentration to stimulate population growth.
- (4) Low oxygen concentration does not limit the population size of either species observed.

The carrying capacity for herbivores in a habitat is most directly affected by the availability of

- (1) heat energy released by carnivores
- (2) carbon dioxide in the atmosphere
- (3) photosynthetic organisms
- (4) decomposers in the soil

The increasing demands for fossil fuels has led government and businesses to consider several possibilities to solve the energy crisis. Which solution will reduce the impact of this crisis on the environment and future generations?

- (1) increase the number of drilling sites for crude oil in North America
- (2) build more power plants away from population centers
- (3) limit the number of people in each vehicle
- (4) develop alternative fuel sources that can be produced from renewable resources

An energy pyramid is represented below.



The energy for use by organisms in level A originally comes from

- (1) producers (3) level B
- (2) the Sun (4) level D

One possible pathway for the evolution of elephants is represented in the diagram below.



Which statement concerning this pattern of evolution is correct?

- (1) Evolution always results in favorable traits.
- (2) Evolution does not always result in a species that will survive to present time.
- (3) Evolution leads to less complex organisms.
- (4) Evolution results in the same changes in all species.

Which compounds present in insects are composed of the amino acids that provide the Venus flytrap and sundew with much of their nitrogen?

(1) proteins

(3) carbohydrates

(2) sugars

(4) fats

Base your answers to questions 32 and 33 on the statement below and on your knowledge of biology.

Scientists have found a gene in the DNA of a certain plant that could be the key to increasing the amount of lycopene, a cancerfighting substance, in tomatoes.

32 The process of inserting this gene into the DNA of a tomato plant is known as

- (1) selective breeding (3) cloning
- (2) genetic engineering (4) replication
- 2 Which row in the chart below best describes decomposers?

Row	Method of Nutrition	Recycles
(1)	autotrophic	nutrients
(2)	heterotrophic	nutrients
(3)	autotrophic	energy
(4)	heterotrophic	energy

Certain antibacterial soaps kill 99% of the bacteria present on hands. Constant use of these soaps could be harmful over time because

- (1) more pathogens may be resistant to the soap
- (2) microbes prevent viral diseases
- (3) large populations of pathogens are beneficial to the hands
- (4) the soap stimulates skin cell division