Living Environment 3rd Quarter Final Review Topics

UNIT ONE: Science of the Living Environment

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. **Placebo:** A sugar pill or other "fake" treatment give to the control group so subjects do not know which group they are in.

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

5. **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.

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.

UNIT TWO: Characteristics of Living Things

A. All living things must maintain homeostasis.

1. To maintain homeostasis, organisms carry out the same basic life functions: **nutrition, excretion, transport, respiration, growth, synthesis, regulation and synthesis.** *Know these terms*!

2. All life processes make up an organism's **metabolism**.

3. Failure to maintain homeostasis causes disease and death.

B. Nutrition:

1. **Autotrophs** make their own food, while **heterotrophs** eat other organisms.

2. **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.

    a. Plants have **stomates,** small holes in their leaves that let them exchange the gasses used in photosynthesis. **Guard cells** open and close the stomates.

C. 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.

1. **Aerobic respiration** requires oxygen, and yields more ATP (energy) for a molecule of sugar than **anaerobic** (no oxygen) respiration.

2. When humans are forced to get energy from anaerobic respiration, we produce lactic acid that damages muscles ("the burn" you feel during exercise).

3. **Photosynthesis and Aerobic Respiration are opposite reactions!** They are also important in cycling oxygen, carbon, hydrogen and water through the environment.

D. Transport:

1. **Diffusion**: movement of molecules from high concentrations to low concentrations. Requires no energy (passive transport).

2. **Active Transport** requires the use of energy, usually moving molecules from a low concentration to a high concentration (against the flow of diffusion).

3. **Osmosis** is the diffusion of water into or out of the cell. If water diffuses into the cell, the cell swells (get larger) and may burst. If it loses water (being put in salt water for example) it will shrivel up.

E. Regulation: coordination and control of other life functions.

1. A **stimulus** is a change in the environment that you **respond** to.

2. A **neuron** is a nerve cell.

3. An **impulse** is the electrical signal carried by the nerves. Neurotransmitters are chemicals that help carry the impulse.

4. A **hormone** is a chemical signal secreted by different glands in the body. Examples of hormones include **insulin, adrenaline, testosterone** and **estrogen**

5. **Receptor molecules** are proteins on the surface of the cell membrane that receive signals from the nervous and endocrine system. These are needed for your cells to communicate and work together.

F. Chemistry

1. The most common elements in living things are (in order) Carbon, Hydrogen, Oxygen and Nitrogen (CHON).

2. **Organic Compounds** have Carbon AND Hydrogen (ex: $C_6H_{12}O_6$ is organic, H_2O, CO_2, and NO_3 are not). Organic molecules are also larger than inorganic molecules.

3. **Carbohydrates** are sugars and starches. All carbohydrates are made from simple sugars (like glucose) and they supply energy.

4. **Lipids** store energy and include fats, oils and waxes. They are made from fatty acids and glycerol.

5. **Proteins** are made from **amino acids. Proteins** also make hormones and many body and cell structures, so *as far as your body is concerned, proteins are by far the most important of these three organic molecules.*

    a. It is the SHAPE of proteins and how they fit together that determines what proteins can do.

    b. Four specific jobs of proteins:

1) make **enzymes**

2) make **receptor molecules** on the cell membrane. These are used to receive chemical messages (like hormones).

3) make **antibodies**

4) make **hormones**

c. **Enzymes** are **catalysts** – they affect the rates of chemical reactions.

1) **lock and key model** – one type of enzyme fits one type of molecule. Change its shape and the enzyme will no longer work.

2) **very high temperatures** cause proteins and enzymes to lose their shape so that they no longer work properly. This is why high fevers are dangerous.

6. **pH**: The pH scale measure the strengths of **acids** and **bases**. A low pH (0-6.9) is a acid, a high pH (7.1-14) is a base, and 7 is neutral (water).

G. Cells- Cells are the basic unit of life. All living things (except viruses) are made of cells.

1. You must know the cell theory (all living things are made of cells).

2. You must know the differences between plant and animal cells.

3. You must know the following organelles: *cell membrane*, cell wall, nucleus, chloroplast, cytoplasm, ribosome, vacuole, mitochondria

4. **The cell membrane** is made of lipids and proteins. It shows selective permeability – that is only some molecules can pass through it (typically small molecules like water and oxygen). Large molecules (like starch or protein) need to be moved by active transport.

a. NOTE: Students often assume cells have a cell wall OR a cell membrane. ALL cells have a cell membrane, including those with cell walls (plants, fungi, some bacteria and protists). The cell wall is mostly for protection; the cell membrane is needed to control movement into and out of the cell. The animal kingdom is the only kingdom that completely lacks cell walls.

H. Classification-

1. Organisms are classified mostly by evolutionary history. Those with common ancestors are grouped together.

2. **Kingdoms** are large groups of related organisms (fungi, bacteria, protists, animals, plants).

3. A **species** is able to successfully reproduce amongst its members.

4. A scientific name is made up of an organism's *Genus* and *species*.

UNIT THREE: Reproduction

A. Asexual reproduction:

1. Advantages: faster, easier
2. Disadvantage: no variety. Offspring are the same as parent.

B. Sexual reproduction:

1. Advantage: variety
2. Disadvantage: more time, effort and risk.

C. Mitosis

1. Asexual
2. One division => two identical, diploid (2n) cells.
3. Chromosome number in the daughter cells is **the same** as in the parent cell.
4. Large organisms use mitosis for growth and healing. Simple organisms use it to reproduce.

UNIT FOUR: Genetics:

A. Humans have 46 chromosomes, or 23 homologous pairs.

B. Chromosome pairs carry alleles for the same trait. We all have two alleles for each gene - 1 from each parent, 1 on each member of the homologous pair.

C. While genes determine our traits, **the environment can affect expression of genes.**

D. Each chromosome has hundreds or thousands of genes. Each gene codes for a particular protein (**1 gene=1 protein**).

E. DNA is made of 4 bases: **ATCG**. A three letter **codon** represents a specific amino acid. These amino acids are assembles into proteins.

F. Base pairs: A-T, C-G (in RNA, A-U and C-G)

G. RNA carries the genetic code to ribosomes. The ribosomes then synthesize **protein** (see page 2 for more about proteins).

H. Changes to DNA are called **mutations**. They can only be passed on if they occur in reproductive cells (sperm or egg).

I. All cells in the body contain the same genes. Only some of these genes are turned on (that is, your eye cells contain the instructions on how to make bones, but only the genes to make new eye cells are actually turned on). We do not yet know exactly why this happens.

J. Selective breeding produces animals and plants with desired traits (disease resistance, larger fruit, more meat or milk, specific colors).

K. Genetic engineering or **gene splicing** inserts genes of one organism into the genes of another. Enzymes are used to cut and copy the DNA segments. Bacteria are often used

because they have no nucleus protecting their DNA and they reproduce very quickly, allowing large amounts of medicine (insulin) to be made.

a. The example of gene splicing you MUST know:

The gene to make human insulin was inserted into bacteria. These bacteria can now make insulin that is exactly the same as human insulin. This insulin is used by diabetics. This is safer than the cow and sheep insulin that were used in the past.

L. New technologies (**karyotyping, DNA fingerprinting**) are making it easier to diagnose and treat genetic disease, though we cannot yet cure them.

M. Genetic research has posed many **ethical** problems (ie right and wrong) that science alone cannot answer.

Unit 5: Evolution

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

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

1. Overproduction of offspring.
2. Competition for limited resources.
3. Survival and reproduction OR death.

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. They do not get a trait just because it is needed.

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

G. Species with more variation are better able to survive environmental changes.

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).