Biology 112 – Exam Review Answers

***Exam Review Sheet #1***

1. Redi’s experiment on spontaneous generation is considered a controlled experiment because he did not only cover a jar with cheesecloth to prove that flies did not come from meat, he also left one jar uncovered as a “control” – an experiment against which he could compare his results to show the effects of the one variable he changed.
2. Pasteur created the special “swan-necked” flask to disprove the theory of spontaneous generation. The flask allow in air, which came in contact with the broth, but did not allow in microorganisms that may have been travelling in the air. This proved that micro-organisms did not come from the broth, not the air.
3. Scientists test only one variable at a time during an experiment so that they will know to what they can attribute their results. Any change in the experiment would be the result of the one thing that was done differently. If multiple variables are used, the results cannot be clearly attributed to any one variable and the cause of the change may remain unknown.
4. Light Microscopes:

Advantages: Light, portable, cheaper

Disadvantages: Not as powerful

Electron Microscopes:

Advantages: Very powerful, offer internal structure view, as well as external 3D images

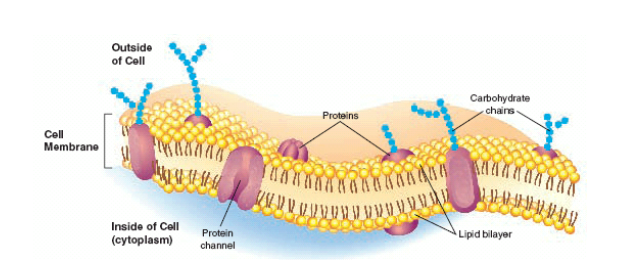
Disadvantages: Very expensive, very large, not portable.

1. See answer to question #3. If multiple variables are used, the results cannot be clearly attributed to any one variable and the cause of the change may remain unknown.
2. The modern cell theory states that:

* All living things are made of cells.
* The cell is the basic unit of structure and function
* Cells can only come from other living cells.

1. A prokaryotic cell has no nucleus, and tends to be smaller and simpler (less organelles).

A eukaryotic cell has a nucleus and tends to be more complex.

***Exam Review Sheet #2***

2. Protein Channels allow in and out certain molecules, making their movement across the cell membrane easier and quicker.
3. Carbohydrate chains acts as “ID” tags for the cell, allowing cells to recognize one another and also recognize foreign invading cells.
4. Small molecules with little ionic charge have the ability to diffuse through the cell membrane with the concentration gradient without energy. Ex: Water
5. Concentration is a type of measurement where the weight of a solute is calculated per the volume of solvent. It’s unit of measure is the g/mL.
6. Diffusion occurs when, due to the random movement of particles, molecules spread out until they reach equilibrium. This means that molecules do not “clump” naturally, but rather spread out until evenly distributed, even across membranes.
7. **Osmosis is a type of diffusion**. Osmosis is related specifically to the movement of water across a cell membrane AGAINST the concentration gradient of a particular solute. It occurs when the solute molecules are too large or too ionically charged to cross the cell membrane.
8. These terms are relative and always used when COMPARING one substance to another. Hypertonic solutions have MORE solute (higher concentration) than the other.

Hypotonic solutions have LESS solute (lower concentration) than the other.

Isotonic solutions have the same concentration of solutes as each other.

1. If a cell is placed in a hypertonic solution, water will travel OUT of the cell and into the environment. The cell will shrink.

If a cell is placed in a hypotonic solution, water will travel INTO the cell from the environment. The cell will expand and could burst.

If a cell is placed in an isotonic solution, the amount of water entering the cell will be equal to the amount of water exiting the cell and the cell’s size will not change.

1. Facilitated diffusion differs from diffusion because it does not rely on the random movement of particles. Instead, molecules can use protein channels to enter or exit the cell, making the process quicker.
2. Active transport required energy. Molecules are pumped in or out by protein channels AGAINST the concentration gradient. Facilitated diffusion uses no energy and molecules move through protein channels WITH the concentration gradient.
3. Facilitated diffusion allows in small molecules that are required for the immediate survival of the cell, such as glucose, Na+, K+, etc…
4. Endocytosis is the movement of large molecules INTO the cell by the infolding of the cell membrane. Liquids move in by a process called pinocytosis and solids move in by a process called phagocytosis.
5. The cell’s mitochondria are responsible for the creation of energy through a process called cellular respiration. Glucose and Oxygen are combined in the organelle to form water, energy and carbon dioxide.
6. The cell’s chloroplasts are responsible for the creating of GLUCOSE in plants through a process called photosynthesis. Sunlight is used to combine water and carbon dioxide in order to produce glucose and oxygen.
7. Cellular Respiration is the cellular process responsible for converting the energy found in food into a usable form of energy for the cell. In order to carry out cellular respiration, the cell:

NEEDS: Glucose & Oxygen

PRODUCES: Carbon dioxide & water (+ released energy)

C6H12O6 + 6O2 🡪 6CO2 + 6H2O + ENERGY

1. Photosynthesis is the cellular process responsible for the creation of glucose molecules which can subsequently be broken down to release energy for use by the cell.

***Exam Review 3 Correction***

1. Each organism is assigned a universally accepted name in order to facilitate communication among scientists. The name doesn’t change from language to language so there’s less confusion, and the name often incorporates some descriptive feature of the organism to help identify it.
2. An organisms scientific name is derived from the name of GENUS and the name of SPECIES groups it belongs to.
3. Carolus Linneaus’ classification system classified organisms based on their physical characteristics instead of on their living space. This provides a better foundation for identifying relationships among organisms. The system is also flexible enough to allow for new groups to be created, groups to be split or groups to be combined, should the need arise. This way, when new organisms are discovered and don’t fit anywhere in the system, the system can be altered accordingly to place them.

1. KINGDOM 🡪 PHYLUM 🡪 CLASS 🡪 ORDER 🡪 FAMILY 🡪 GENUS 🡪 SPECIES
2. Organisms that belong to Kingdoms Eubacteria and Archaebacteria are all unicellular and prokaryotic.

Organisms in kingdom Eubacteria have peptidoglycan in their cells walls, while members of the Archaebacteria kingdom either have no peptidoglycan in their cell walls or have no cell walls at all.

1. Kindgom Eubacteria: Unicellular prokaryotes with peptydoglycan

Kingdom Archaebacteria: Unicellular prokaryotes **without**  peptydoglycan

Kingdom Protista: Eukaryotes who don’t have the characteristcs necessary to be Fungi, Plants or Animals.

Kingdom Fungi: Heterotrophic eukaryotes with chitin in their cell walls that grow using hyphae and reproduce using spores.

Kingdom Plantae: autotrophic multicellular eukaryotes with cellulose in their cell walls and who are non-motile.

Kingdom Animalia: heterotrophic multicellular eukaryotes that are motile for at least part of their life.

1. Viruses are non-living structures made up solely of a protein coat surrounding a piece of genetic material (DNA). They cannot reproduce on their own and depend on a host cell to replicate them. Viruses do not eat or use energy.

Bacteria are living unicellular organisms with regular cell structures (cytoplasm, mitochondria, etc…). Bacteria have all the characteristics of life, and therefore reproduce normally, and consume food or produce it through photosynthesis.

1. A virus is mainly made of up of a **nucleic acid** (DNA or RNA) surrounded by a **protein coat** (aka: capsid).
2. A virus’ capsid helps to protect the fragile DNA inside, and also helps to “trick” the host cell into letting in the virus. Carbohydrate chains attached to the proteins on the virus’ capsid can be used to make cells think that the protein are “good”, and thus gain entry into the cell, where the viral DNA will go hide in the cell’s DNA.
3. Viruses are not considered alive in our modern classification system since they do not have all 8 defining characteristics of life (for example, they don’t have cells.). As a result, they do not belong in any of the 6 currently accepted kingdoms. Viruses have a classification system of their own, however, and are grouped according to what they invade. There are three major groups of viruses: Bacteria viruses (bacteriophages); Plant Viruses and Animal viruses.
4. A virus will replicate by first invading a host cell. The viral DNA will then hide in the cell’s DNA, and force the cell to make extra copies of the virus itself, eventually breaking out of the cell and starting the cycle over again.
5. Viruses are dormant when they are not actively replicating to the point of causing symptoms to appear in the host. The host has initiated to immune response to the virus because it has not detected its presence.
6. (See question #7 for differences between bacteria and viruses.) Anitibiotics, as their name suggests, work only on living cells. They are toxic and kill living cells, such as bacteria. Viruses have no cells and are not alive so antibiotics have no effect on them.

1. There are three main shapes of prokaryotes (bacteria):
   1. Cocci (round-shaped)
   2. Bacilli (rod-shaped)
   3. Spirilla (spiral, or corkscrew shaped)
2. Animal-like protists are classified according to how they move:

* Zooflagellates move using flagella (long, whip-like structures that exist in small numbers)
* Ciliates move using cilia (short, hair-like structures that exist in high number)
* Sarcodines move using pseudopods (cytoplasmic extensions of the cell membrane)
* Sporozoans don’t have any structures used for movement and rely instead on the environment.

1. Plant-like protists are classified first by their number of cells, and then by the colour of pigments that they contain.

Unicellular Plant-like Protists: Plankton (in green, brown or red)

Multicellular Plant-Like Protists: Algae & Seaweed (in green, brown and red)

1. Slime molds have a two-part life cycle:
   1. The feeding stage: In this stage, the slime mold is motile.
   2. The reproductive stage: In this stage, the slime mold is non-motile.

***Exam Review 4 Correction***

1. Kingdom Fungi:
   1. Molds: No cells walls between cells of hyphae
   2. Sac Fungi: Sexual spores produced in small sacs
   3. Club Fungi: Sexual spores produced in club-shaped structures found on gills in the cap.
   4. Imperfect fungi: so not produce sexual spores at all!
2. Hyphae are long, unicellularly-thick strands used by fungi to grow and acquire nutrients from the environment. Without them, the fungi would neither get any bigger, nor would it gain any nutrients. It would die.
3. Endospores in bacteria are walls built inside the cell membrane to protect cells from a harsh environment. The spores of Kingdom fungi are cells produced and then liberated (released into the environment) for the purpose of reproduction. Though the words are similar, the structures are entirely different!
4. Plants must obtain **WATER** and **CARBON DIOXIDE** from the environment.
5. All plants are non-motile, multicellular, autotrophic (photosynthetic) eukaryotes with cellulose in their cell walls.
6. Mosses have no true roots, and therefore no way of obtaining water from the ground like most plants. Instead, they rely on diffusion from the environment, which must be humid or moist to ensure the concentration gradient required to diffuse water INTO their cells, rather than OUT OF their cells. Additionally, mosses require running water to disperse their spores during reproduction.
7. Vascular tissue is the network of tube—like tissues designed to facilitate the movement of nutrients throughout the body of a plant.

**XYLEM**: Used to move dissolved sugars from the leaves to the rest of the cells for use in cellular respiration.

**PHLOEM**: Used to move water from the roots to the rest of the cells for photosynthesis.

1. Fruits have built-in mechanisms to help disperse seeds in a variety of ways (usually specific to the species). For example:

* Some have “wings” to take advantage of gusts of wind
* Some are designed to stick to fur to be carried away by animals that brush up against them
* Some are designed to float and take advantage of running water currents to be dispersed.
* Some are built with nutritious flesh that attracts animals with their smell and taste, to be eaten and carried in the digestive tract of the animal and excreted several hours later, presumable far away from the place where it was eaten.

1. Moving water is essential to the survival of a sponge because it is what allows a sponge to carry out the basic processes of nutrition, respiration, excretion and reproduction. Choanocyctes (flagellated collar cells) create water currents by beating their flagella and drawing water in through the pores of the sponge. This moving water brings with it food particles, fresh oxygen supply and sperm cells for reproduction. It also carries away waste particles produced by the sponge before they accumulate to toxic levels.
2. Sponges are classified as animals because they have all the qualifying characteristics of animals: Multicellular, heterotrophic eukaryotes that are motile for at least part of their life.
3. Sponges are filter feeders. They have small “nets” places inside their pores, and when the flagella of the choanocytes create a water current, drawing the water in through the pores, microscopic particles of organic material gets trapped by the nets where it can be absorbed by diffusion (or phagocytosis) by neighbouring cells. The particles can also be picked up by the archaeocytes and carried internally to cells deeper in the tissue of the sponge.
4. Oops. See Number 9 – I accidently repeated a question twice!!
5. As worms evolved, so did their complexity:

Body Cavity: Flatworms do not have a body cavity, roundworms have a false body cavity, segmented worms have a true, fluid-filled body cavity.

Digestive tract: Flatworms have a single digestive system that makes use of an external pharynx and has only one opening that doubles as both mouth and anus. Roundworms have a digestive tract with two openings, separate from one another and more complex mouth parts to allow for predation. Segmented worms have the addition of many internal digestive organs such as an esophagus, a crop, a gizzard and an intestine.

Respiration: Flatworms and Roundworms rely on diffusion alone, Aquatic segmented worms have gills, terrestrial segmented worms use diffusion through the skin of a body covered in mucous to mimic aquatic conditions.

Excretion: Flatworms have flame cells, roundworms and segmented worms have an anus separate from the mouth.

Circulation: Flatworms and Roundworms rely on diffusion, segmented worms make use of a closed circulatory system with blood vessels and a heart.

1. A hermaphrodite is an organism with both male and female reproductive **organs**. Sea sponges are not considered hermaphrodites because they are not complex enough to have organs at all. Even though they produce both sperm and egg cells, they do not do so from reproductive organs.
2. Ganglia are small clusters of nerve cells and make up the processing centers of primitive nervous systems. They could most easily be compared to a human brain, although they are a lot simpler in their structure and processes.