

Lab Safety

- When are goggles, aprons, and gloves used?
 - Goggles: When using hazardous chemicals, hot liquids, or burners**
 - Aprons: When using chemicals, hot materials, and preserved specimens**
 - Gloves: When working with specimens and certain chemicals**
- What are the three parts of the fire triangle?
 - Oxygen, fuel, and heat**
- List the three steps of how to use a fire extinguisher.
 - Pull the pin**
 - Point the hose at the base of the fire**
 - Press the lever**

Scientific Method

- Define the following terms
 - Independent variable – The one variable that is controlled on purpose.**
 - Dependent variable – The variable that responds to the independent variable.**
 - Control – The standard of comparison. (The Independent variable is not applied)**
 - Constant – A factor that is kept the ‘same’ in an experiment. (several)**
 - Hypothesis – An educated prediction**
- How many independent variables should you use in an experiment?
One

Physical and Chemical Changes

- Define physical change and give an example.
A change in appearance such as size, shape, form, & state (ex. paper folded)
- Define chemical change and give an example. Give several signs of a chemical change.
 - A change that results in a new substance (ex. rust, spoiling, formation of salt)**
 - Some signs of a chemical change are bubbling, forming a precipitate, color change, temperature change, light is produced, any chemical/physical property is changed.**
- What element do all organic compounds contain?
Carbon (C)
- Explain a chemical change that happens in the digestive system (chemical digestion).
Carbohydrates are broken down into simple sugars in the mouth. (amylase)
- Explain a physical change that happens in the digestive system (mechanical digestion).
Food is broken down into smaller and smaller pieces in the mouth.
- Give examples of physical and chemical changes in a compost pile.
 - Physical – change of size, shape, and color of matter**
 - Chemical – heat is given off (exothermic), organic matter (new matter) is formed, cannot reverse procedure and go back to original material**

Force, Motion, Energy

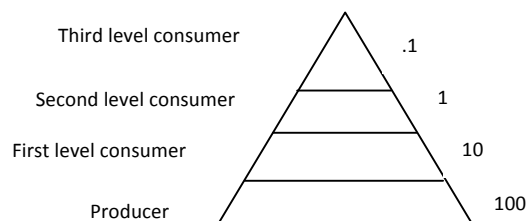
1. What is the formula for work? ***force x distance = work***
The mechanical advantage is the amount of assistance a machine gives you, often allowing you to use less force to do work. (ex. – Pushing a box up a ramp to a truck instead of lifting the box straight up off the ground 3 ft. The ramp increases the distance, but it also increases the mechanical advantage so you don't have to use as much force.)
2. Solve the following:
How much work is done if you move a box weighing 10 N over a distance of 60 meters?
(Label your answer with the proper unit of measure.)
10N x 60 meters = 600 Joules or 600 N/m
3. Determine if work is being done in the following situations. Explain why or why not.
 - a. You are trying to move an elephant out of the driveway. You push and push, but the elephant doesn't budge. Is work being done?
No; movement must occur. (Unbalanced forces are necessary for movement to occur.)
 - b. You are helping your brother move to college. Both you and your brother are lifting the couch and carrying it up a ramp to the moving van. Is work being done?
Yes; the object moved in the direction of the force. (push/pull)
4. What is the difference between potential and kinetic energy? Give an example each.
 - A. ***kinetic energy – Energy in motion (windmill turning)***
 - B. ***potential energy – Stored energy, or energy of position. (book on a top shelf)***
5. What is the transformation of energy during digestion?
Energy is transformed from chemical energy locked up in food, to mechanical energy (Kinetic Energy) when the body moves.
6. What is turgor pressure? ***Pressure exerted by water on the inside of cells.***
7. What is geotropism? ***The effects of force of gravity (plant roots grow downward)***
8. What is phototropism? ***A plant's response to light; it leans toward the light source.***

Flow of Energy in Ecosystems

1. Write the chemical equation for photosynthesis.
$$6\text{CO}_2 + 6\text{H}_2\text{O} + \text{sunlight} \xrightarrow{\text{chlorophyll}} \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$$
2. Explain the energy transformation during photosynthesis.
Solar Energy (Light) is transformed into chemical energy (glucose)
3. Write the chemical equation for respiration.
$$\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \longrightarrow 6\text{CO}_2 + 6\text{H}_2\text{O} + \text{energy}$$
4. What is the relationship between respiration and photosynthesis?
They are opposite equations. The reactants of one are the products of the other

5. Give an example of how matter cycles within living systems.
Organic matter decomposes returning nutrients back to the soil to be used by plants.
6. What is the difference between a food chain, food web, and energy pyramid? Give an example of each.
- Food chain – represents how energy is passed on through the feeding relationships in an ecosystem.**
 - Food web – Intersecting food chains**
 - Food Pyramid – A pyramid showing how 10% of the energy is passed up to each level.**

7. How much energy is passed up in an energy pyramid?
Only 10% from the previous level is passed up to the next level. If 100 units of energy begins at Level 1 (producers), 10 energy units goes to Level 2 (first level consumer), 1 energy unit goes to Level 3 (second level consumers), and .1 of an energy unit goes to Level 4 (third level consumers). Each time the amount reduces by 10%.



8. Define producer, consumer, and decomposer and give an example of each.
- Producer – organism that makes food, and is on the bottom of the food chain. (plants)**
 - Consumer - organism that can not make food, and gains energy by eating others**
 - Decomposer – Breaks down dead plants and animals and restores nutrients back to the soil.**

Factors Impacting the Environment

- How do the following impact ecosystems:
 - Flood – loss of life, disease, property loss, contaminated water, and destruction of crops**
 - Hurricane – High winds, flooding, mudslides, landslides, property damage**
 - Tornado – Property loss, secondary damage such as fire due to damage.**
 - Earthquake – Ground breaks, land slides, fires, tsunamis, property damage, loss of life.**
 - Tsunami – High water flooding, drowning, contamination of water, animal and human loss, fires from broken gas lines**
 - Volcano – Hot lava, poisonous gases, landslides, fires, and explosions, and flash floods**
- What is the difference between weathering, erosion, and deposition? Where in Texas would be an example of each of these?
 - Weathering: Breaking down of rock into sediments and soil**
 - Erosion: the movement of sediments, soil, and rocks**
 - Deposition: The depositing (dumping off) or sediments, soil, and rocks**
- What is the difference between ground water and surface water?
 - Ground water: Water found below the surface of the ground (aquifers and recharge zones).**
 - Surface water: Water found above ground (streams, rivers, lakes, wetlands, and oceans)**

Humans can contaminate the water by pollution, runoff of chemicals from fertilizers, pesticides, and herbicides, as well as overuse and consumption.

5. Define recharge.

The area where water infiltrates the ground through porous rock to replenish the aquifers.

6. Define aquifer: **permeable rock, sand, or gravel through which ground water flows, creating an underground water reservoir containing enough water to supply wells and springs. If water runs out, the ground can weaken and give way to sink holes.**

7. Explain the water cycle –

Water falls to the ground as a type of precipitation (snow, sleet, hail, drizzle, or ice) and evaporation occurs due to heat energy turning the water into water vapor, (as well as transpires from plants). The water vapor turns into condensation as it cools in lower temperatures, and when it begins to collect, it starts to precipitate once again. Precipitation – Evaporation - Condensation

8. What is the difference between “point” source pollution and “nonpoint” source pollution?
Point source pollution can be identified as coming from one specific location (ex. Sewage plant). Nonpoint source pollution is caused by a broader range of sources and is difficult to identify and control (ex. Runoff from streets, farms, contaminated watersheds, etc.)

Organisms and the Environment

1. Describe the following biomes and list some organisms that would live there.

- **Tundra - Northern most biome, cold, dry, treeless, ducks, geese, reindeer.**
- **Taiga – Largest biome – cone bearing trees, moose, and bear**
- **Temperate Deciduous Forest – 4 seasons, deciduous trees that loose leaves in the fall, deer, elk, and rabbits**
- **Temperate Rain Forest – Pacific NW (US) Trees w/ needle-like leaves, black bear, and amphibians**
- **Tropical Rain Forest – Most biologically diverse. (4 zones –floor, understory, canopy, and emergents) Wide variety of plants and animals.**
- **Grasslands – Prairies, plains, and farmland primarily dominated by grass, grazing animals**
- **Desert – Driest biome – warm and cold at night, plants are mainly cactus, few animals such as the kangaroo rat, insects, and reptiles.**

2. What is a microhabitat? Give several examples.

A microhabitat is an environment that has a unique set of ecological conditions, and is within a larger habitat. (Ex. fallen log, a lump of grass, under a rock)

3. Define biodiversity, population, community, niche, limiting factors, and ecosystem.

A. biodiversity: A variety of living organisms

B. population: The total number of a particular species

C. community: All the species that live in a particular area or region

D. niche: A particular purpose/role an organism fills within an environment as it relates to other organisms to ensure survival.

E. limiting factors: Things in an ecosystem that might limit what can live there (ex. Not enough food or water)

F. ecosystem: All the biotic (living) and abiotic (nonliving) things in an area

Biodiversity helps to sustain life in an ecosystem because almost all species are dependent on other species to live. They depend on other species for food, soil quality (such as plants' dependence on earthworms), shelter, and even for bodily processes like digestion.

5. Describe how ecological succession might happen if you stopped mowing your lawn.
Ecological succession would progress so that grass would grow taller, insects and animals that either find shelter or graze on grass would increase, possibly birds would feed on the insects, and eventually shrubs then trees would develop until a climax community is established.
6. Give examples of primary and secondary succession.
 - A. ***Primary Succession (Succession without the presence of soil) Exposed glaciers / volcanic rock (Rock is broken down by pioneer species such as mosses and lichens to develop soil)***
 - B. ***Secondary Succession (Succession with the presence of soil) Forrest fire / flood / parking lot vacated. (Soil present would begin with grasses and weeds, then shrubs, trees, and associated species of animals would be drawn to the area.***

Structure and Function of Cells

1. State the cell theory.
Cells are the basic unit of life. Cells come from existing cells. All living things are made up of cells. Cells carry out similar functions
2. Plants and animals are organized into levels of organization with the smallest being cells. What are the other levels?
(smallest to greatest) cells → tissues → organ → organ system → organism → population → community → ecosystem → biomes → biosphere
3. Be able to tell the function of the following cell parts:
 - Cell membrane- ***protects the cell and is semi-permeable which means it controls what moves in and out of the cell***
 - Cell wall – ***found only in plant cells; provides support for cells***
 - Nucleus – ***stores genetic material***
 - Cytoplasm – ***gel-like substance inside cells***
 - Mitochondria – ***bean shaped organelle that convert chemical (glucose) energy to energy that the cell can use***
 - Chloroplasts – ***only found in plant cells; oval shaped organelle that converts light energy into chemical energy (food) in the form of glucose***
 - Vacuole – ***found in plants and animals, but in plants there is one large vacuole; stores water and nutrients***
4. How does a cell function in the same ways that an organism like you does?
Organisms are made of organ systems that have specific purposes. These carry out functions. Examples of these functions include reproduction and metabolism (use food) and growth. A single cell has organelles (tiny organs) that assist the cell in doing these same functions just on a smaller scale.

5. What specific function are the following internal structures adapted for:
- Xylem in plants – ***cells that make up the xylem move water from the roots of the plants to the leaves of the plants where water is needed for photosynthesis***
 - Gills in fish – ***cells in the gills exchange carbon dioxide gas (waste) for oxygen gas (needed for cell respiration) from water molecules***
 - Hollow bones in birds – ***bone cells grow differently so that the bones are not solid; bones are less dense which allows for flight***

Human Body Systems

1. Name the function of the following systems
 - Digestive – ***converts chemical (food) energy into energy the body can use; mechanical and chemical digestion occur before nutrients and energy is absorbed in to blood and carried throughout the body for cells to use***
 - Respiratory – ***inhales and exhales air (mixture of gases); oxygen that is inhaled through the lungs and carried by red blood cells to throughout the body to the rest of the cells; cells produce a waste gas called carbon dioxide which is also carried out by red blood cells and exhaled through the lungs.***
 - Circulatory – ***made up of different types of blood vessels that move nutrients and waste throughout the body; heart is the pump***
 - Nervous – ***made up of the central and peripheral nervous system; provides feedback from internal and external stimuli and allows the brain or spinal cord to respond.***
 - Endocrine – ***controls homeostasis by releasing hormones (ex: insulin is a hormone that controls the amount of sugar in blood)***
 - Integumentary – ***protects the body and prevents water loss (skin)***
 - Muscular – ***movement of body and attached to bones (cardiac, smooth, skeletal)***
 - Skeletal – ***provides structure, something for muscles to pull against/makes red blood cells.***
 - Urinary – ***controls water balance and chemical balance by filtering and cleaning blood***
2. What is the correct sequence of the level of organization in organisms?
(tissues, cells, systems, organs, organisms)
cells → tissue → organ → systems → organism
3. Explain homeostasis.
All the systems in an organism maintaining equilibrium. Ex: when the temperature in your body rises, your sweat glands release sweat, which pulls heat from your body to maintain your body temperature.

Genetics

1. Define heredity. ***Passing genetic traits to offspring.***
2. Compare sexual and asexual reproduction. Which gives more diversity?
Asexual reproduction is making a copy of the genes so the offspring is identical to the parent. Sexual reproduction is the combining of genes from different parents and the offspring is different from both parents but has some traits from the male and some from the female. Sexual reproduction gives more diversity.

3. Define DNA, genes, alleles and chromosomes.
DNA – molecule that gives instructions for making an organism/ double helix
genes – segment of DNA/provides instructions for one trait
alleles – different versions of a trait (complimentary genes for the same trait)
chromosomes – DNA that is coiled up/tightly wound
4. Where are chromosomes found? **in the nucleus**

Genetic Adaptations

1. Know how to use a dichotomous key.
2. Give examples of physical or structural adaptations that enhance survival.
Color camouflages from predators; claws used for climbing trees; flowers are colorful to attract pollinators
3. Give examples of behavioral adaptations that enhance survival.
hunting at night, birds sing to attract mates, hibernating to conserve energy
4. Give examples of physiological adaptations that enhance survival.
prey that tastes sour or bitter to predator, odor emitted to offend a predator
5. Explain natural selection and give an example.
Organisms are different (Think back to the lab with white “bugs” and black “bugs”) because of genetic traits. As organisms grow and reproduce in the environment some traits are better suited for the environment. The black “bugs” were better suited for the black paper environment because it was harder for predators to see the bugs. White “bugs” stood out more in the darker environment and were eaten more often. Nature “selected” the black “bugs” to be successful.
6. Explain selective breeding and give an example.
Humans choosing the best traits; breeding dogs because you want a certain color or kind (Retriever); breeding horses because for speed or agility; breeding fruits to be seedless.

Earth and Space

1. Write a definition or description of the following components of our solar system.
 - **Sun – Average, yellow star, most massive body in our solar system**
 - **Inner planets – Mercury, Venus, Earth, Mars**
 - **Outer planets – Jupiter, Saturn, Uranus, Neptune**
 - **Dwarf planets - Pluto**
 - **Asteroid belt – Millions of rocks orbiting the sun between Mars and Jupiter**
 - **Meteoroid – Small rocks that float in space. (Smaller than asteroids)**
 - **Meteor – Meteoroids that break up in the atmosphere due to friction**
 - **Meteorite – Debris from meteors that hit the surface of the earth**
 - **Comet – Dirty snowballs made of ice, dirt, and water vapor that orbit the sun**

2. Explain how proximity to the Sun, availability of water, and composition of the atmosphere are important factors to determine if life can exist on a planet.
Distance from the sun is important because it determines temperatures in which living organisms can exist with liquid water. Distances too close to the sun would cause water to evaporate, and distances too far away would cause water to freeze. The atmosphere must also contain oxygen and carbon dioxide for photosynthesis and cellular respiration to occur in order to sustain life.

3. Since the vacuum of space is hostile to human life, list some accommodations that must exist in the space suit, space craft, or space station that allow humans to survive.
(Thermal protection, radiation protection, pressurization, oxygen, food supply, water supply, waste management, maneuverability, adjustments to microgravity, adjustments to physiology, communication, recycling, and weight limits.)

4. What are some changes that happen to the human body when an astronaut stays in space for awhile?
 - A. Fluids pool around the chest and head causing swelling and headaches***
 - B. The heart gets weaker due to lack of gravity***
 - C. Muscles get weaker and bones get porous and weaker due to microgravity***
(Astronauts must exercise once or twice daily to compensate for the lack of gravity on their body.)

5. What is the magnetosphere and how does it help our planet?
The magnetosphere is a magnetic field around our planet that protects life by deflecting charged particles created by the sun (solar wind).

6. What does the ozone layer in the atmosphere do for our planet?
The ozone layer protects life on Earth by absorbing harmful radiation from the Sun (ultraviolet rays, gamma rays).