

Name: _____

LIVING ENVIRONMENT MIDTERM EXAM – THE BARE

ESSENTIALS What you absolutely need to know for the Exam!

What is the best way to study?

- Get a good night's sleep
- Eat a healthy breakfast

What is the format of the exam?

Approximately 85 questions.

Part 1 → **50** multiple choice (general biology content)

Part 2 → **13** points constructed response

What should I bring to the exam?

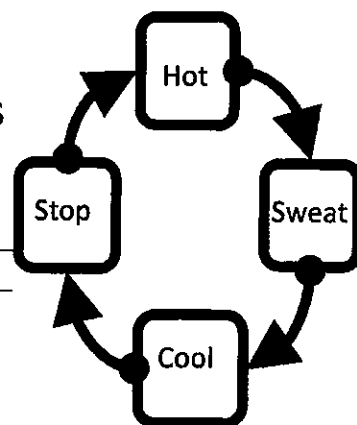
~~Wednesday, January 24, 2018~~ You have **1 1/2** hours for the exam.

- Black or Blue pen for the constructed response
- Pencil and eraser – to complete the graph and scantron
- Calculator (optional) – simple 4 function.

NO GRAPHING CALCULATORS ALLOWED.

- Other than calculator **NO ELECTRONIC DEVICES ALLOWED.**

UNIT ONE – CHEMISTRY & THE CELL / ORGANIC COMPOUNDS



I. All living things must maintain **homeostasis** in order to stay alive.

A) **Homeostasis:** _____

B) Failure to maintain homeostasis results in _____ or _____

C) Homeostasis is often maintained using feedback mechanisms.

1. **Feedback** mechanisms are **cycles** in which the product of one reaction causes another to start or stop.

D) While organisms are balanced, they are not unchanging. The term used to describe the balanced state is **dynamic equilibrium**.

1. **Dynamic Equilibrium:** _____

II. **Life Processes:** All living things carry out the same basic **chemical processes**. Taken together, these processes make up an organism's _____

A) **Metabolism:** All the **chemical processes** that take place in an **organism**.

1. **Nutrition:** _____

2. **Cellular Respiration:** Convert **energy** in food into a usable form _____

3. **Synthesis:** Make complex compounds from _____

4. **Transport:** _____

5. **Regulation:** Control and coordination of life processes.

6. **Excretion:** _____

7. **Reproduction:** _____

III. **Inorganic Molecules:** Simple compounds (Do NOT contain both carbon and hydrogen)

A) **Water** (____) Most common substance in all living things (about 60% of body mass)

- Needed for chemical reactions (which won't happen in "dry" conditions)
- Dissolves molecules into **solution**, allowing them to be **transported** through the body.

B) **Carbon Dioxide** (____)

- With water, used by plants to make glucose during **photosynthesis**.
- Waste product of **cellular respiration (aerobic)**.

C) **Oxygen** O_2 Needed by **most** (not all) organisms for _____

- Released by plants and algae as a waste product of _____
- **Cellular respiration (aerobic):** Process that uses oxygen to release **energy** from glucose (sugar). Used by most organisms.
- **Fermentation (anaerobic):** Process that releases energy from glucose without using oxygen. Provides less energy, so only used by a few simple organisms such as some bacteria and yeast. These organisms do not need to take in oxygen.

D) **Nitrogen** N_2

- Most common gas in air (70%).
- Needed to make _____

- Converted into **nitrates** by **decomposers** such as fungi and soil bacteria. Nitrates are absorbed by plants which are then eaten by animals.
- Excreted as waste in **urine**.

E) Acids and Bases:

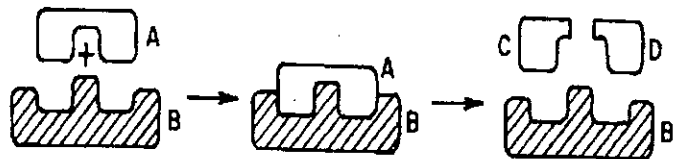
- Measured by the _____ (0.0 – 6.9 acid, 7.0 neutral, 7.1 – 14.0 base)
- pH can affect rates of chemical reactions; for example, digestive **enzymes** work fastest in acidic environments, which is why we make stomach acid (hydrochloric acid, or HCl).

IV. **Organic Compounds:** Large, complex molecules (polymers). Always contain the _____. Synthesized from simpler substances called monomers (building blocks).

A) Carbohydrates: sugars and starches

1. Building blocks = simple sugars such as **glucose**
2. Functions:

- _____
- _____



Starch (A) is broken down by an enzyme (B) into two simple sugars (C & D). This is a good example of the **lock and key model**.

B) Lipids: fats and oils

1. Building blocks = _____ & _____
2. Functions:

- _____
- Insulation
- Water proofing (hydrophobic)
- Make up the cell membrane and steroid hormones. (phospholipids)

C) Proteins: Complex compounds that carry out all the body's activities. (Growth and Repair of cells)

1. Building blocks = _____
2. Have many different functions which are determined by the _____
3. **Lock and Key Model:** Proteins must have the right shape to "fit" with other molecules.
 - **Changing the shape of a protein changes what it can interact with and its function.**
4. Important types of proteins:
 - **Enzymes** – act as **catalysts**, _____
 - High temperatures cause enzymes to _____ This is why high fevers are dangerous.
 - **Membrane Proteins** – part of cell membrane; help with transport into and out of the cell, and receive chemical messengers such as neurotransmitters and hormones.
 - **Antibodies** – attack foreign **pathogens**
 - **Neurotransmitters** and **hormones** – carry messages through the body.

D) Nucleic Acids (DNA and RNA):

1. Building blocks = _____ (with nitrogen bases – DNA has ATCG, RNA has AUCG)
2. DNA found in genes and chromosomes. RNA helps to produce proteins (protein synthesis).

– CHEMISTRY & THE CELL / THE CELL

I. The cell is the basic unit of structure and function in all living things.

A) **Cell Theory** has three parts:

1. _____
 - Unicellular – single celled organisms (amoeba, paramecium)
 - Multicellular – have more than one cell; may be just a few cells, or many *trillions* of cells. Almost all structures in multicelled organisms are either made of or by cells.
2. _____
 - Everything you do is the result of the work of your cells – walking, talking, even thinking and feeling. When you get sick, it is because your cells are not working correctly.
3. _____

This seems obvious now, but at one time people believed in *spontaneous generation*, the idea that living things regularly emerged from nonliving things.

Exceptions to the Cell Theory

- _____ are not made of cells. Viruses do not carry out all life processes, so many biologists do not consider them true living things.
- _____ could not come from another cell. (BIG QUESTION? How did first cell begin?)

II. **Organization** (smallest to largest)

- A) **Molecules** _____
- B) **Organelles** – _____
- C) **Cells** _____
- D) **Tissues** – _____
- E) **Organs** – _____
- F) **Systems** -- _____
- G) **Organism** – _____
- H) **Population** – members of the same species living in the same place at the same time.
- I) **Community** – Many different populations living in the same place at the same time.

III. **Cell Organelles:** These are the tiny cell parts that make up a cell.

1. **Nucleus**

- _____
- Contains hereditary material (chromosomes, genes, DNA)

2. **Cytoplasm** (technically not an organelle)

- _____
- Helps transport material

3. **Mitochondrion**

- _____
- Gives cell usable **energy** in the form of _____

4. Ribosome

- Makes _____

5. Vacuole

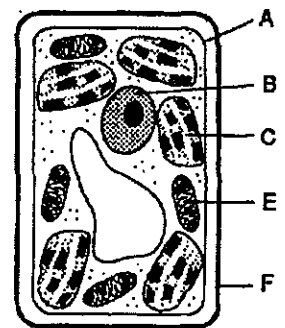
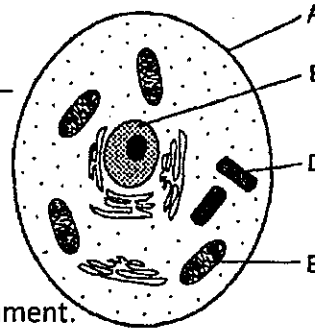
- _____
- Food vacuoles with lysosomes may digest large molecules.
- Waste vacuoles may excrete waste out the cell membrane
- Plant cells have LARGE water vacuoles.

6. Chloroplast

- _____
- Found ONLY in plant cells and algae cells.

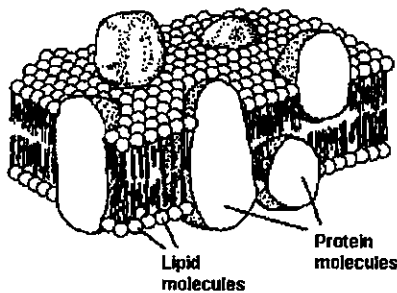
7. Cell Wall

- Gives _____
- NEVER found in animal cells.



8. Cell Membrane

- Separates cell interior from outer environment.
- Made of two layers of _____



- Controls what enters and leaves the cell using **membrane proteins**. This is part of regulation and homeostasis.
- Has **receptor molecules (proteins)** that pick up signals from other cells.
- Also has protein "tags" that identify the cell (see immune system).

- **Diffusion** – _____
_____. A form of passive transport that does NOT _____



- **Osmosis** – _____ Water moves into or out of the cell from an area of high concentration to an area of low concentration.

- **Active Transport** – substances move into or out of cells from an area _____
_____. Requires the use of _____



– CHEMISTRY & THE CELL / NUTRITION

Reminder – All life processes are **chemical activities** which make up your

metabolism.

I. **Nutrition:** _____ for various activities including:

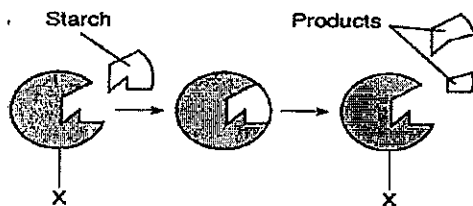
1. growth
2. repair damaged tissue
3. synthesis (building)
4. cellular respiration (energy)

A) **Ingestion:** _____

B) **Digestion:** To break down nutrients (polymers) into smaller molecules (monomers).

1. Nutrients must be broken down into smaller parts so that they can be _____

- Carbohydrates (such as starches) are digested into monomers called _____
- Lipids (such as fats and oils) are digested into monomers called _____
- Proteins (such as meat and fish) are digested into monomers called _____



Starch is broken down by enzyme (X)
into two simple sugars (Products).
"Lock and key model"

C) **Autotrophic Nutrition:** Organisms take inorganic molecules (CO_2 & H_2O) and convert them into organic nutrients (carbohydrates such as sugars and starches).

1. Autotroph = _____
2. **Photosynthesis** is most common form of autotrophic nutrition.
3. Producers such as plants, algae and some bacteria (cyanobacteria) are common autotrophs.

D) **Heterotrophic Nutrition:** Organisms must consume nutrients from other organisms.

1. Heterotroph = _____
2. All animals and all fungi and some bacteria are heterotrophs.
3. Includes:
 - **Carnivores:** eats animals
 - **Herbivores:** eats plants or algae
 - **Omnivores:** eats both plants and animals
 - **Decomposers:** breaks down dead matter and waste
 - Decomposers are important decay organisms for recycling nutrients.

HUMAN ANATOMY & PHYSIOLOGY

I. **Organization:** The human body is made of **cells**.

A) All humans (and most other organisms) begin life as a **single** cell.

1. This single cell is called a **zygote**.
2. The nucleus of this cell has **all** the genes needed to become a complete organism.

B) Humans grow as a result of **mitosis** (cell division).

1. This quickly increases the number of cells in the body until there many trillions of cells.
2. Since all new cells come from the same single cell, they all share the same **genes**

C) As cells divide, they begin to develop into specialized **tissues**.

1. **Specialization** or **Differentiation**:

2. Cells specialize by

- Ex: A white blood cell has turned off all genes needed to make skin, bone, or nerves. It still has those genes, but only the genes needed to be a white blood cell remain active.

D) As the body continues to develop, different tissues work together to form **organs**.

E) Organs work together to form

F) Organ systems work together to help a person

II. **Digestive System:**

A) Food is broken down so that it is small enough to

1. Food is broken down mechanically (chewing) and chemically (using enzymes).
2. Nutrients and water are absorbed into the body in the

B) The digestive system is a one way passage through the body that includes the

C) Food is moved through the digestive system by smooth muscular contractions called

D) Undigested food is eliminated as

COMMON MISTAKES !

"The digestive system excretes waste."

The digestive system does not excrete waste. Feces are undigested food. (see excretory system).

"The digestive system gives you energy."

Digestive system provides nutrients, including glucose. Energy is gained by cellular respiration.

III. **Circulatory System**

A) Moves materials through the body to the organs, tissues and cells that need them.

B) Transported materials include:

1. _____ from **intestines** to all cells of body.
2. _____ from lungs to all cells of the body.
3. **Hormones** from glands to **target cells**.
4. **Waste** from all cells to the **excretory organs**.

C) Materials usually enter and leave the blood through **diffusion**.

1. **Diffusion**:

- Example: There is a high concentration of oxygen O_2 in the lungs, so oxygen diffuses from the lungs into the blood, which has less oxygen.

2. **Capillaries:** _____

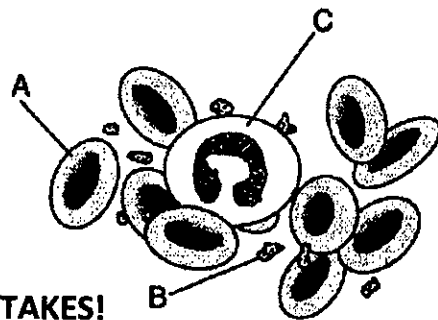
D) The **heart** is the pump that drives the circulatory system. Blood vessels called veins _____ while arteries carry blood _____

E) **Red blood cells** _____ **White blood cells** _____

1. Hemoglobin: Protein in red blood cells that carries _____

F) **Plasma** is the fluid of the blood. Transports all blood cells, _____

G) **Platelets** _____



Red blood cells (A),
platelets (B) and
white blood cells (C).

COMMON MISTAKES!

"The heart pumps oxygen to the body."

Technically true, but the heart pumps blood (which carries the oxygen) everywhere in your body.

"The heart gives you oxygen."

No materials diffuse in or out of the blood when it is in the heart. This only occurs in capillaries.

Interactions between body systems

A) The different systems of the body work together to maintain homeostasis. Some examples:

1. *Nutrients from the digestive system are transported to cells by the circulatory system.*

Classification- Organisms are classified based on their evolutionary relationship.

A) **Domains** are largest group of related organisms.

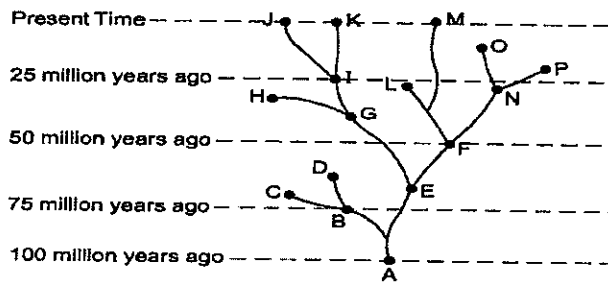
1. Eukarya Domain has organisms with **eukaryotic** cells (cells WITH a nucleus). Includes single-celled and many-celled organisms.

2. Archea and Bacteria Domains have organisms with **prokaryotic** cells (cells WITHOUT a nucleus). Includes single-celled organisms only.

B) **Kingdoms** are large groups of related organisms (Protists, Fungi, Plants, Animals).

C) A **species** is able to successfully reproduce with its members and produce _____

- D) The scientific name of an organism is the **genus** plus the **species** name. The genus name comes first but is like the last name of a person. The same genus indicates closely related organisms.
- Example: *Panthera leo* (lion) and *Panthera tigris* (tiger) are closely related. But *Ursus actos* (brown bear) and *Phascolarctos cinereus* (koala bear) are NOT closely related.
- E) Branching tree diagrams (phylogenetic trees and cladograms) are often used to show evolutionary relationships.



Evolutionary trees show the relationship between living species and extinct species.

LAB SKILLS

I. Terms:

- A) **Observation:** _____
- B) **Inference:** _____
- C) **Hypothesis:** _____

D) **Theory:** _____

1. Theories tie together many scientific facts, hypotheses and laws.
2. **Common Mistake:** "Theories are things that are opinions, or are not proven."
This is an incorrect use of the word "theory" in a scientific context. A scientific theory is not a simple guess or conjecture, and is strongly supported by evidence.

II. **Controlled Experiments:** Compares the results of an experiment between one or more experimental groups with a "normal" group.

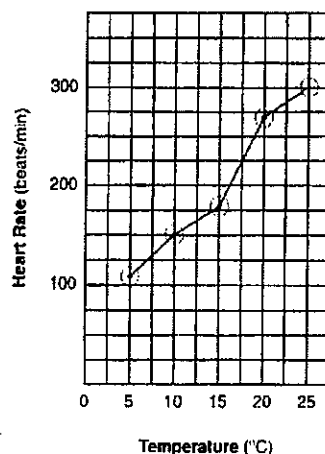
- A) **Experimental group:** _____
- B) **Control group:** _____
- C) **Placebo:** A sugar pill or other _____ given to the control group. Usually only needed when using human subjects.

- D) **Independent Variable:** _____
1. The "If" part of an "If-then" hypothesis. This is the "treatment."
 2. The independent variable is always plotted on the _____
- E) **Dependent Variable:** Variable that is _____
1. The "then" part of an "If-then" hypothesis.
 2. The dependent variable is always plotted on the _____

III. Data Tables and Graphs

- A) **Data tables** are used to _____ which will be plotted in a graph.
1. First column in the table is for the **independent variable**.
 2. Second column is another for the **dependent variable**.
 3. Each column should be titled, and include units of measurement.
 4. Data (independent variable) must be arranged in either ascending or descending order.

Data Table	
Temperature (°C)	Heart Rate (beats/min)
5	108
10	150
15	180
20	270
25	300



- B) Both the x and y axis of the graph must be labeled. These labels are typically the same ones used in the data table. Once again units of measurement must be written with the label.
1. The **independent variable** is always plotted on the **x-axis**.
 2. The **dependent variable** is always plotted on the **y-axis**.
- C) The x and y axis must be numbered.
1. **These numbers must increase by uniform spacing** (that is you must count by 2's, 5's, etc.).
 2. **Your numerical scales should take up most of the axes.** Squeezing it all into the bottom corner makes the graph impossible to read and no credit may be given.
 3. Graphs are often line graphs, but bar graphs may be used. Check test directions carefully.
 4. **DO NOT USE ARROWS. DO NOT USE "BREAK" SYMBOL.**

Example of a Controlled Experiment:

Hypothesis:

If people chew gum it will improve their memory.

Independent variable:

Chewing gum – some people will chew gum, some will not.

Dependent variable

Memory – all groups should have their memory checked both before and after the experiment to see if it was improved.

Control Group

Doesn't chew gum (remember – the control group never receives the new treatment)

Experimental Group (INDEPENDENT VARIABLE)

Group that chews gum.

Constants

Should be the same for both groups:

People in each group should be of similar health with similar memory, with similar mixes of sexes, ages, and ethnicities. Each group should also be tested in the same way.

Data Collected

You should test people's memories both before and after the experiment.

IV. Characteristics of a good experiment:

- A) Can be repeated the same way and get the same results.
- B) Have large sample size/many test subjects.
- C) Are performed over longer periods of time.
- D) Test only one independent variable. All other characteristics of the tested groups should be the same.
- E) Are peer reviewed – examined by other scientists to determine its accuracy.
- F) Must test the hypothesis and show whether it is wrong or right.
- G) Is objective – the experiment and conclusion are fair and unbiased. Fact and opinion are not mixed.
- H) The experiment follows established ethical and legal standards.

REQUIRED REGENTS LABS

I. Diffusion Through A Membrane

A) Part A

1. What you did:

- Made a model cell using dialysis tubing.
- Put glucose and starch inside your "cell."

