

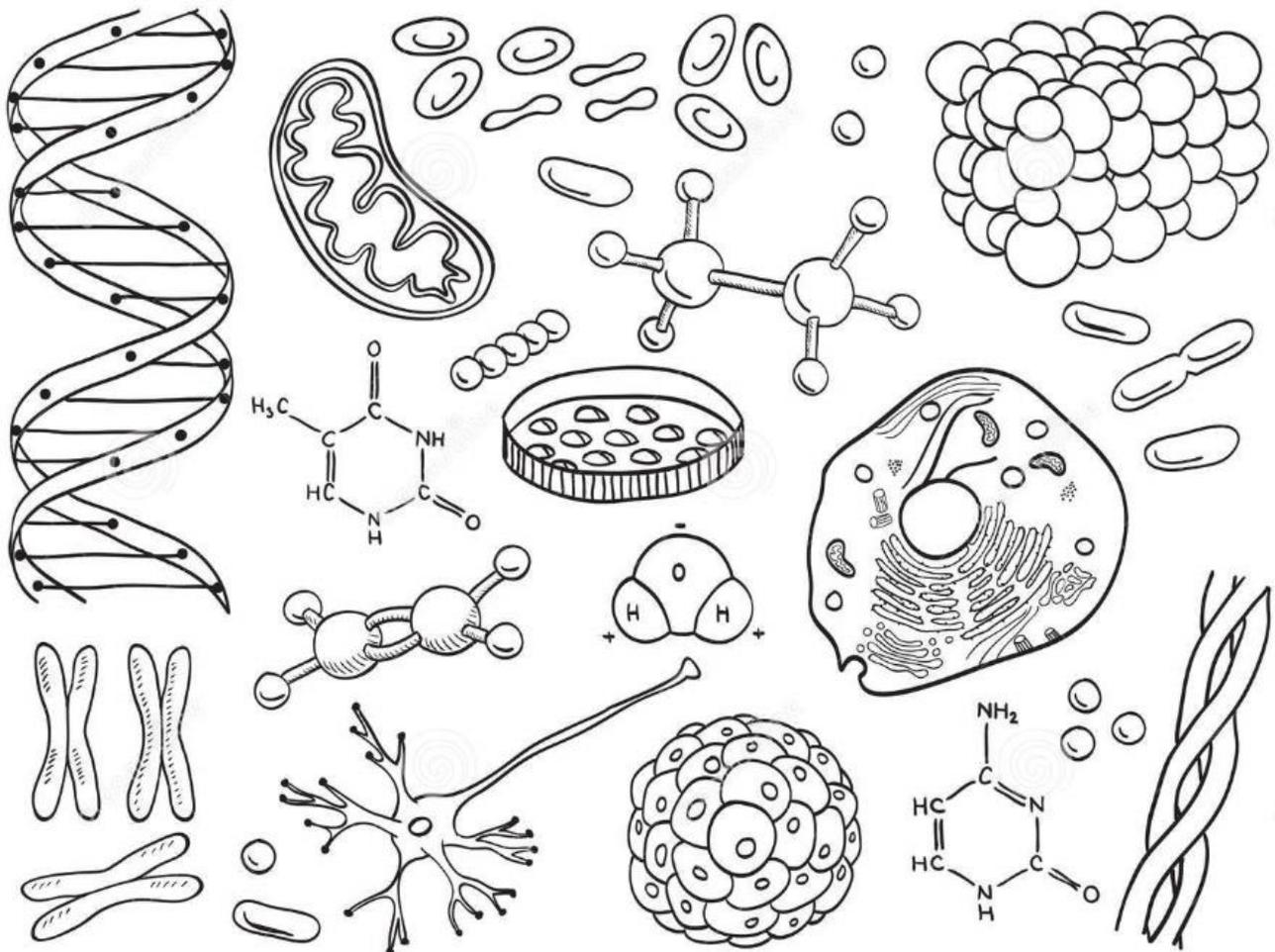
AP BIOLOGY SUMMER ASSIGNMENT FOR TESTING MAY 2019

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AP BIOLOGY SUMMER ASSIGNMENT INSTRUCTIONS

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Course: AP/IB BIOLOGY

✓ **Purpose of the Summer Assignment:**

AP Biology will be a very intensive course, as we need to finish the 2-year material in one year. Though we will have a double period every day, there is still a lot of new material to learn. The only way we can do this is because you already have one year of background in Honors/Pre-IB Biology. This summer assignment is a review of the main topics we covered in first semester Honors/Pre-IB Biology and by having these topics fresh in mind when you come into the AP class, it will make it easier to move through them faster and more efficiently. You will be expected to be familiar with the information in this assignment, as it will be used as a basis for our class and referred to at critical points during the class.

✓ **Relationship between Summer Task and 1st Quarter Objectives:**

This summer assignment is intended to focus on the background knowledge of the concepts underlying the main topics that we will cover in the first quarter of AP Biology class.

✓ **Description of the Task:**

This summer assignment consists of eight focus areas (topics) for ease of connection to your previous study at Honors/Pre-IB Biology level. Answer all the questions in all handouts, in your best handwriting. (If your best is not legible, then practice your handwriting as well over the summer, since I can't grade what I can't read.)

✓ **Supportive Resources:**

Use any websites or books for reference. Indicate in your assignment all the references you use for each topic. All answers requiring more space should be answered in a spiral notebook. As AP Biology students, you are expected to become quite independent and disciplined learners.

Grading:

✓ **DUE DATE:**

Please don't put off this assignment until the end of the summer. Space out the topics over time and the work will not seem so overwhelming. Some of the material may be new to you, but it is important that you find all of the answers. Everybody needs to have this assignment done **by the first day of school.**

✓ **DEADLINE:**

The summer assignment must be completed **by FRIDAY of the first week of school.**

✓ **Grading Category:**

We will review the summer assignment and there will be a quiz on each of the focus areas beginning of the second week of school. While the completion of the summer assignment will be credited to Completed Work category, the summer assignment-based quiz credited to the Formative Assessment category.

✓ **Points:**

The completion of the summer assignment will earn 20 points in the Completed Work category.

Each summer assignment-based quiz will be 10 points in the Formative Assessment category.

✓ **Extent to which the summer task counts towards the marking period grade:**

Less than 5% of the marking period grade.

✓ **Grading Criteria and Rubric: (can be attached as a separate sheet)**

For Completed Work category:

- 0% to Less than 25% completion = 0 points
- Between 25% and 50% = 12 points
- Between 50% and 100% = 20 points

For Formative Assessment category:

- Each quiz (multiple choice) of 10 questions = 10 points

TOPIC I INTRODUCTION TO CHEMISTRY

The smallest unit of matter that retains the properties of an element is the _____.

In the center of every atom is a compact core called the _____.

The _____ contains two types of subatomic particles, the _____ and the _____. A _____ carries a _____ charge and a _____ carries a _____ charge.

The third type of subatomic particle is the _____ which carries a _____ charge. Atoms have equal number of _____ and _____. The net atomic charge of an atom is _____.

The key difference between the atoms of different elements is the number of _____ and _____ they contain.

There are _____ elements found in nature and another approximately _____ elements artificially produced. The elements are arranged in the _____ in increasing order of number of _____.

The four most abundant elements found in living things are: _____, _____, _____ and _____.

The links between atoms are called _____.

Chemical bonds can be either _____ or _____.

Ionic bonds consist of _____ of electrons between two elements. One element gains electron(s) and becomes a _____ ion, also called a(n) _____. The other element loses electron(s) and becomes a _____ ion, also called a(n) _____.

Covalent bonds consist of _____ of electrons between two atoms. There are _____ types of covalent bonds depending on how many electrons are involved. A single covalent bond consists of the sharing of _____ electrons. A _____ covalent bond consists of the sharing of _____ electrons. A _____ covalent bond consists of the sharing of _____ electrons. These charged atoms are more _____ than the neutral atom and they will form chemical bonds with other ions to form _____.

A group of atoms linked by covalent bonds is called a _____. Some examples of molecules are: _____.

The pH scale indicates the strength of an _____ or a _____. The pH scale is from 0 to 14. The range from 0 to 6 indicates an _____ solution, 7 indicates a _____ solution and the range from 8 to 14 indicates a _____ solution.

TOPIC II.
Biochemistry
Review

Answer the following questions:

1. What are the four major macromolecules of life?
2. What are the elements that make up carbohydrates, lipids and proteins?
3. What are the monomers of the 3 major macromolecules of life in question 2? Why are amino acids so important for the human body?
4. What are the two types of fats and the differences between them? Give examples of foods in which you can find each.
5. What are trans-fats (hydrogenated oils) and why are they considered bad for health?
6. How and where do plants store sugars? What about animals?
7. What is cellulose? Does it have any function for the human digestion?
8. Identify 5 functions of proteins, 5 of fats (indicate some benefits of body fat), 2 of carbohydrates.
9. What are the essential nutrients for the body?
10. What are the two types of carbohydrates and the differences between them? Give examples of foods where each can be found.
11. Define metabolism.
12. What types of food contain proteins?
13. If fat gives twice as much energy as carbohydrates, why not just eat fat?
14. What is glucose, its formula and its importance?
15. What are calories?
16. What is cholesterol? Explain why it is both good and bad for the human body.
17. What are vitamins and minerals? Name the main ones. Why are they important for our health?
18. How does the Food Pyramid help with nutrition?
19. How does severe dieting affect metabolism?
20. When we eat the cells of another animal (like muscle cells - steak, or leaf cells - spinach) what happens to the protein and the DNA in those cells that we eat? How are we able to use cow proteins and cow DNA, or spinach proteins and spinach DNA for the growth and development of our human bodies?

TOPIC III.
Cellular structure and organelles

Look for the definition and function of each of the cellular organelles below (this must be in your own words)

CYTOPLASM

NUCLEAR ENVELOPE

NUCLEUS

CELL WALL

NUCLEOLUS

RIBOSOME

ROUGH ENDOPLASMIC RETICULUM

SMOOTH ENDOPLASMIC RETICULUM

GOLGI APPARATUS

LYSOSOME

MITOCHONDRION
(pl. mitochondria)

VACUOLE

CHLOROPLAST

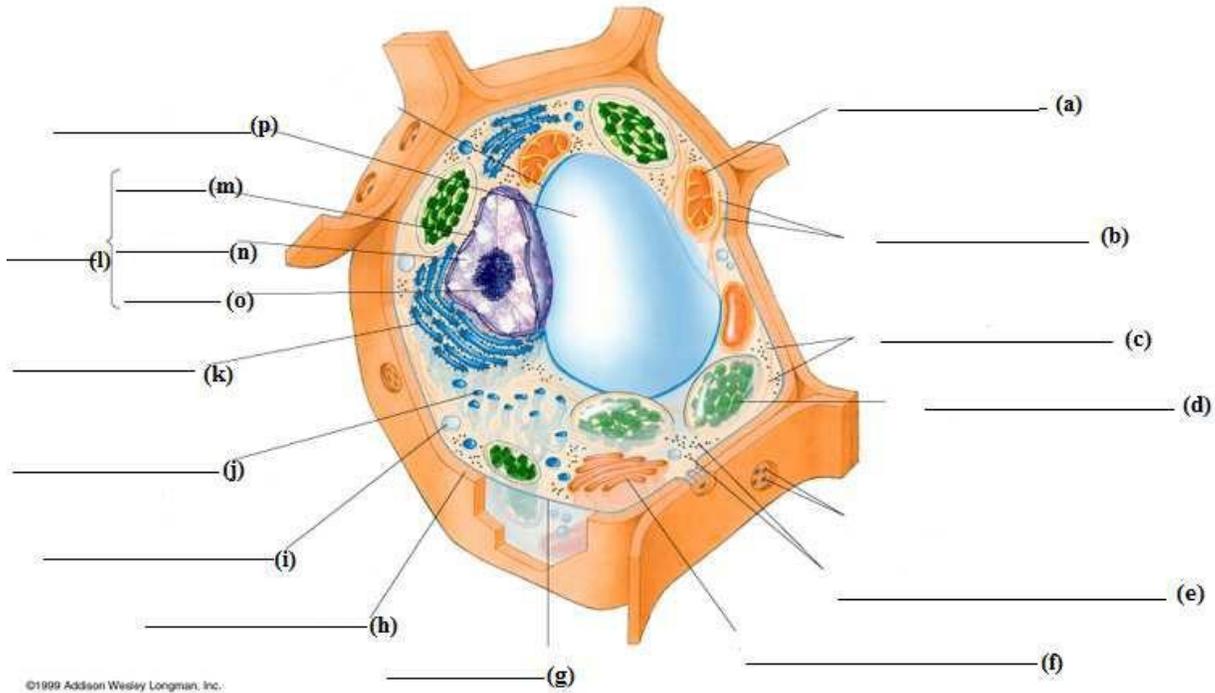
MICROFILAMENTS AND MICROTUBULES

PEROXISOMES

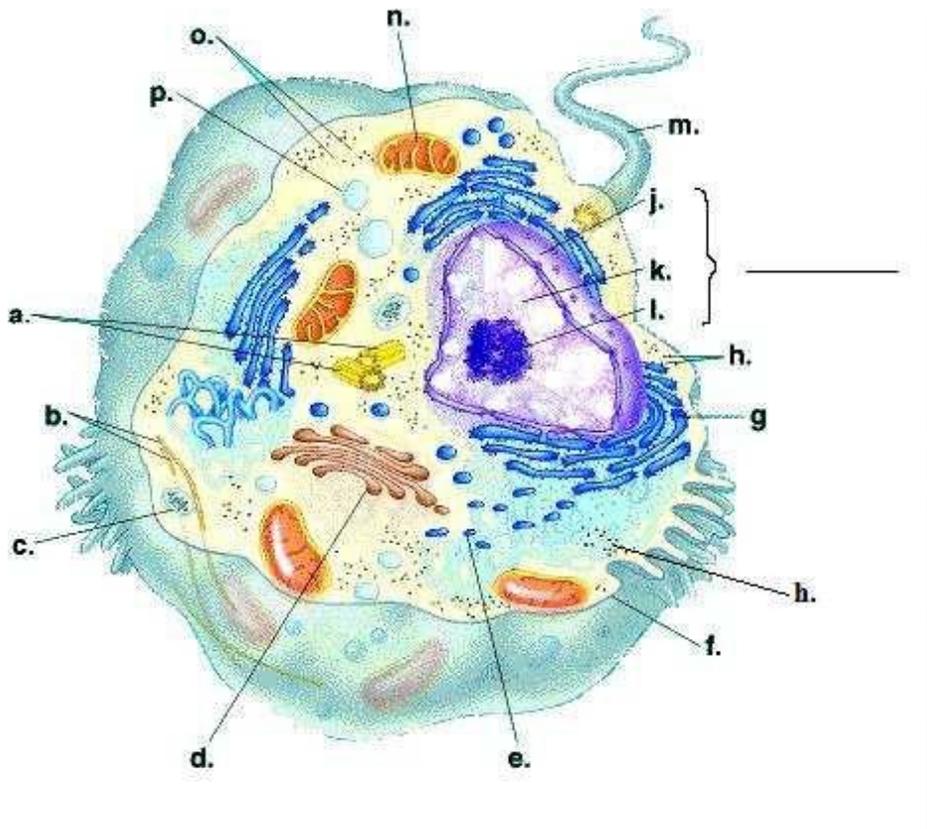
CELL MEMBRANE

Tour of the cell – Label the indicated structures in these diagrams of plant and animal cells

Plant Cell

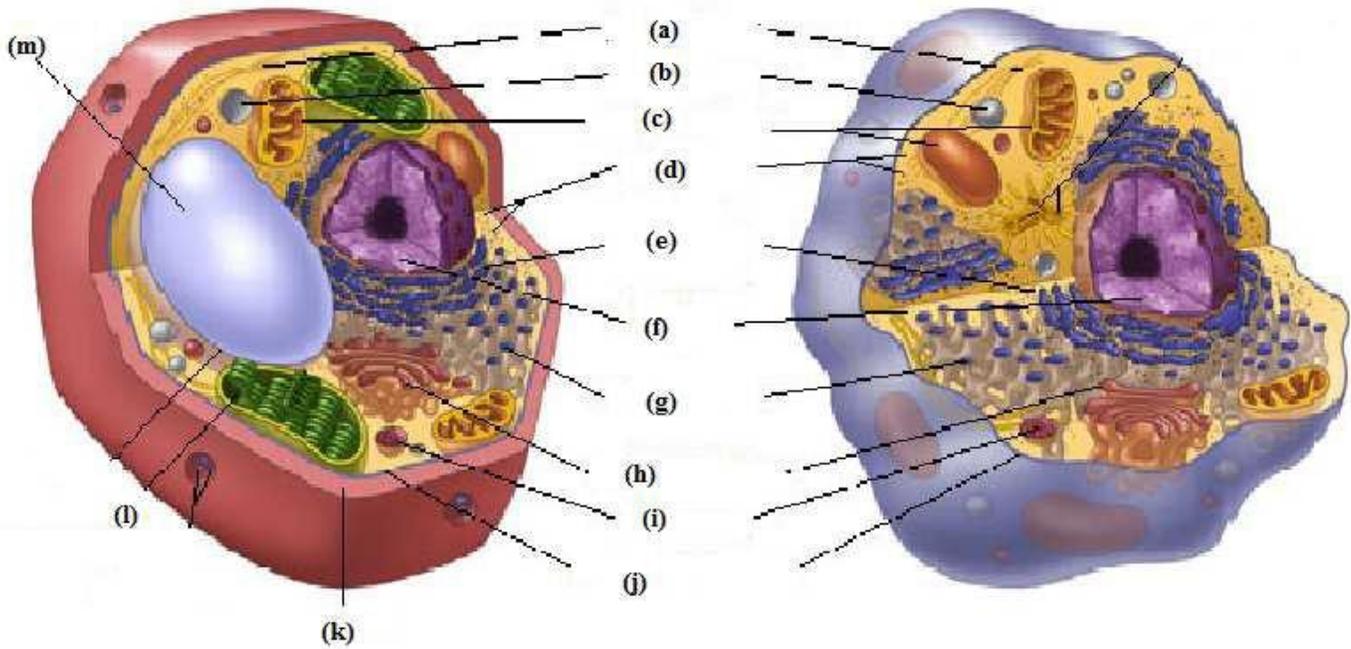


Animal Cell – write the names next to the letters



Compare plant and animal cells.

Compare a plant and an animal cell by identifying the common parts and the unique parts to the plant cell.



_____ Cell

_____ Cell

(a) _____

(g) _____

(b) _____

(h) _____

(c) _____

(i) _____

(d) _____

(j) _____

(e) _____

(k) _____

(f) _____

(l) _____

(m) _____

Add any missing parts of the cells, by drawing a line and labeling with the consecutive letters:

Topic IV. Cell Membrane

Vocabulary – use the following words to describe the composition of a cell membrane (A) and how it works (B), in a couple of paragraphs in your own words:

A. Permeable – selectively (semi) permeable

Phospholipid bilayer
Proteins
Cholesterol
Carbohydrates

Hydrophilic – water loving -
Hydrophobic – water hating -

B. Concentration (mass per volume) –
Solution – solute, solvent, solubility
Concentration gradient

Hypertonic (“above strength” – high concentration) Hypotonic
 (“below strength” – low concentration) Isotonic (“same” –
equal concentration on both sides)

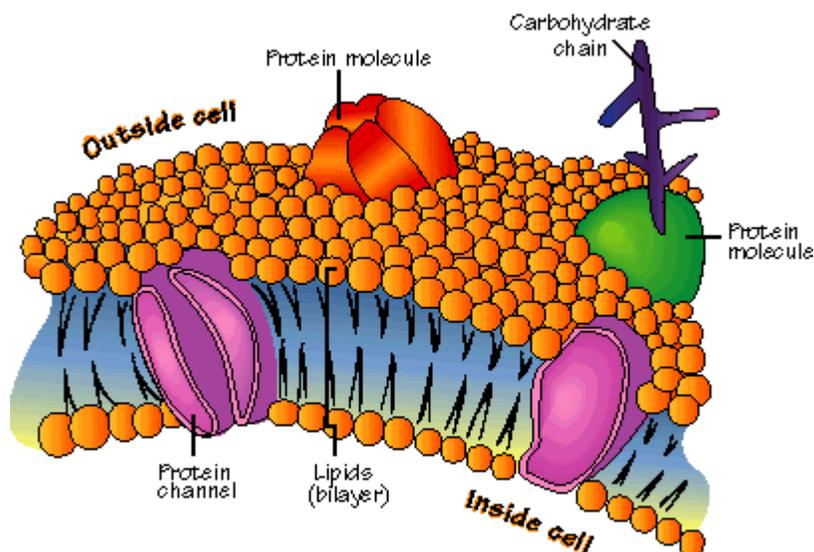
Turgid Flaccid
Plasmolysis

Describe each of the following types of transport:

Diffusion, Osmosis, Passive Transport, Active Transport

Exocytosis, endocytosis, (phagocytosis, pinocytosis)

Cell membrane structure



CELL MEMBRANE – fill in the blanks –

The cell membrane organizes the chemical activities of the cell. It surrounds the cell and controls the traffic of molecules into or out of the cell. Some scientists consider it more important to the cell functioning than the nucleus.

The cell membrane is **selectively permeable** because _____

The main structure of cell membranes is composed of _____. Because of this, only molecules soluble in _____, also called hydro _____ molecules can pass through the membrane freely. On the other hand, hydro _____ molecules depend on _____ to cross the lipid bilayer. The most important to life of these latter molecules is _____.

A **solution** is a _____

Some examples of solutions are: _____

A solution has two components, one that dissolves, called the _____ and one that is the medium in which the other dissolves, called the _____.

When a substance has the ability to dissolve in another to form a solution, it means that this first substance is _____ in the other.

The concentration of a solution could be defined as the _____ of the _____ per _____ of _____ . Solutions can be concentrated or dilute, depending on how much solute is present.

How are these terms about solutions important to the study of cell membranes?

The following terms are extremely important to the understanding of the transport across cell membranes:

Hypertonic solution (“above strength” – solution with _____ concentration of solutes than on the other side of the membrane)

Hypotonic solution (“below strength” – solution with _____ concentration of solutes than on the other side of the membrane)

Isotonic solution (“same strength” – solution with _____ concentration of solutes on both sides of the membrane)

Transport across membranes

Some molecules cross membranes without using any energy and other molecules need cell energy to cross.

1). **Passive transport** is when substances cross the cell membrane ___with / without_____energy, going freely from where they are ___more / less___ concentrated to where they are ___more / less___ concentrated.

This can be observed in every day's life in the following examples:

(1) _____

(2) _____

(3) _____

(4) _____

Passive Transport is also called _____. There are two types of diffusion, free and facilitated diffusion.

Free diffusion is the tendency of particles to spread from where they are _____ concentrated to where they are _____ concentrated, like in the examples above. This means molecules diffuse down **concentration gradient** until equilibrium is reached. Molecules continue to move back and forth in equilibrium without change in concentration. In cells only hydro _____ molecules can diffuse freely through the cell membrane. Why?

Facilitated diffusion needs protein channels to help hydro _____ molecules cross the phospholipid bilayer.

Transport proteins are embedded in the membrane and they act as pores for passage of particular solutes down their _____.

The main molecule that crosses in this way is _____, crucial to life.

The special type of facilitated diffusion that water uses to freely cross membranes is called _____.

It is the water movement through a selectively permeable membrane from a "weak" solution, also called _____ to a "strong" solution, or _____ until equilibrium is reached, called _____. This means that when the solute concentration outside the cell is higher than the one inside the cell, the water will move ___into / out_____ the cell, making the cell ___smaller / bigger____. In this case water goes from a _____ tonic solution towards a _____ tonic solution until it reaches equilibrium and both side become _____ tonic.

On the other hand, when there is higher concentration inside the cell than the outside, the water will move from ___inside / outside___ of the cell towards the ___inside / outside___ of the cell. In scientific terms, water moves from a _____ tonic solution towards a _____ tonic solution until equilibrium is reached and both sides are _____ tonic. This specific process of water movement across cell membranes is called _____.

How does osmosis differ from diffusion? _____

Balance of water between cells and their surroundings is crucial to life. Water needs to be able to cross freely the cell membranes. Why isn't it able to cross by itself? _____

How does it cross the membrane? _____

The reason why water moves across membranes is to release of **osmotic pressure** created by the difference in the concentrations on the two sides of the membrane. It's easier to have water balancing out the concentration rather than moving other solutes. Also, water can move freely across the membrane.

In order for plant cells to be healthy, they need to have a _____ concentration of water inside the cell, in order to keep their rigid structure and grow against gravity. Plant cells have adapted to keep this osmotic pressure:

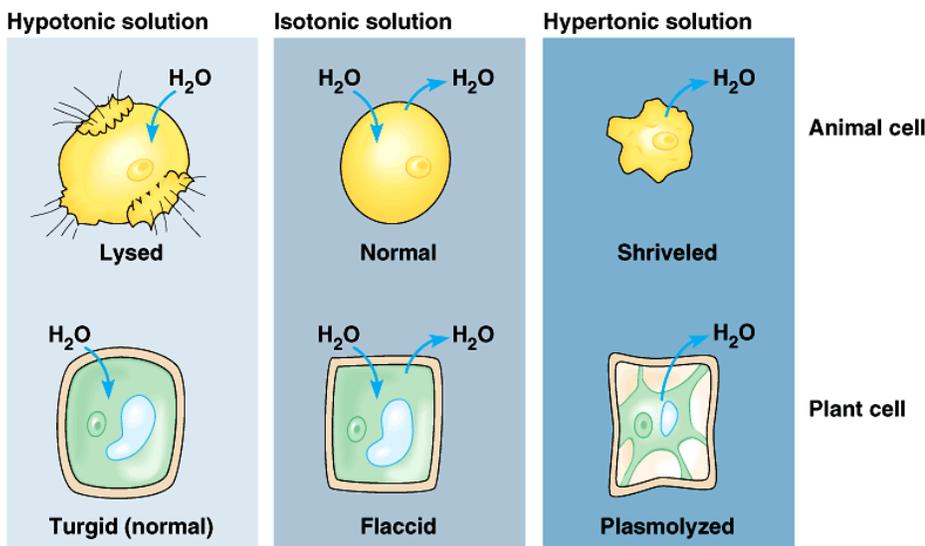
Cell wall

Outside the cell membrane

Supports and protects the cell by holding the pressure and preventing the cell from excess water uptake and bursting

Vacuole

Hold excess water and it pumps it out as needed



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Analyze the picture above and complete the following paragraph:

Plant cells can be firm or _____. This is the _____, healthy state for plant cells, when in a _____ environment. On the other hand, an animal cell would _____ and die in this environment, as it has no way to protect from the excess water _____ that happens through _____. When placed in an _____ environment plant cells become _____ which leads to plant bending, as there is no pressure inside to keep them turgid. However, this is the preferred environment for the animal cells. Why? _____

In a _____ environment, both animal and plant cells _____, as the water moves _____ the cell through the process of _____. Animal cells would die. In plant cells this process is called plasmolysis, or the plant cells are _____ (shrink) - this is when the plasma membrane pulls away from the cell wall, as excess water goes out of the cell. The cell wall protects the plant cell from dying right away and they can go back to normal when the concentration of solutes is lowered on the _____ of the cell. When this happens, the water will move from a _____ solution towards a _____ solution through the process of _____.

2). **Active transport** is when molecules cross the cell membranes by moving from low concentration to high concentration _____ energy input. Transport proteins actively pump specific small solutes across membrane against their concentration gradient. This can be done with small molecules or with large molecules. For large molecules this type of transport is called

- **Endocytosis is** – _____
 - o **Phagocytosis is** – _____
 - o **Pinocytosis is** – _____
- **Exocytosis is** – _____

Endocytosis / Exocytosis

http://highered.mcgraw-hill.com/sites/0072437316/student_view0/chapter6/animations.html#

Cellular Transport !

http://www.wiley.com/legacy/college/boyer/0470003790/animations/membrane_transport/membrane_transport.htm

Construction of cell membrane step by step tutorial

http://www.wisc-online.com/objects/index_tj.asp?objID=AP1101

Cell Membrane Structure

<http://www.susanahalpine.com/anim/Life/memb.htm>

Osmosis

http://highered.mheducation.com/sites/9834092339/student_view0/chapter38/animation_-_osmosis.html

Cellular Transport !

http://www.wiley.com/legacy/college/boyer/0470003790/animations/membrane_transport/membrane_transport.htm

Endocytosis / Exocytosis

http://highered.mcgraw-hill.com/sites/0072437316/student_view0/chapter6/animations.html#

TOPIC V
PHOTOSYNTHESIS

Answer the following questions in your notebook:

How do plants use the energy from the sun to produce sugars?

ATP (Adenosine Triphosphate) -

- What is ATP and what is its structure (draw and label)?
- What is the relationship between ATP and ADP?
- How does ATP work in the energy cycle in nature?

How do plants use the energy from the sun to produce sugars?

What is the balanced equation of photosynthesis?

Where does Photosynthesis happen?

What are the gases involved, how and where are they exchanged?

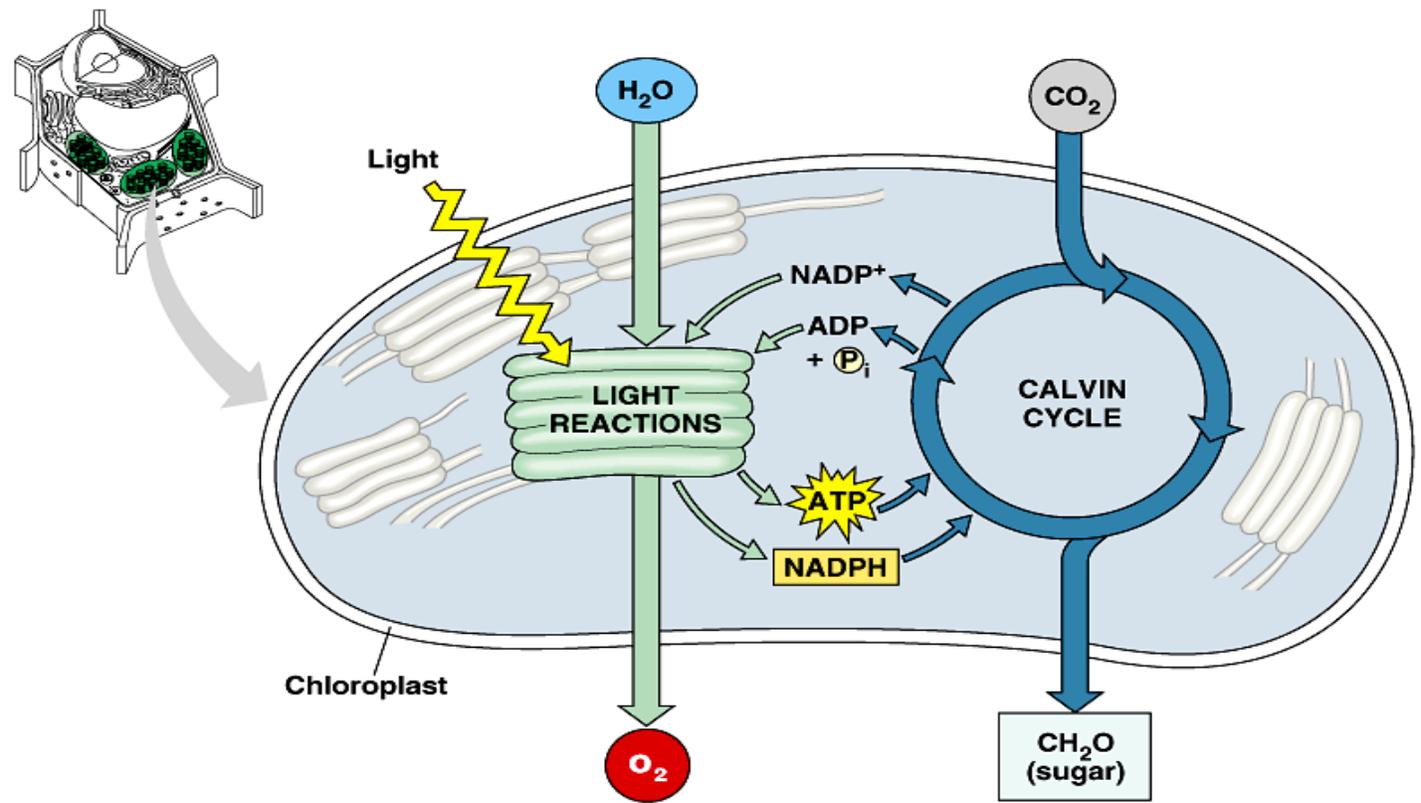
Why are most plants green?

What are pigments? What are the main pigments in plants?

What is the structure of the **chloroplast** and what is the function of each part? Draw a labeled diagram.

What are the stages of photosynthesis – for each stage – purpose, where it happens, what it starts with, what it produces, how it happens (describe process)– summary in your notebook

- A).Light Reactions
- B).Light Independent Reactions (Calvin Cycle)



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Topic VI. Cellular Respiration

What it is -

Purpose -

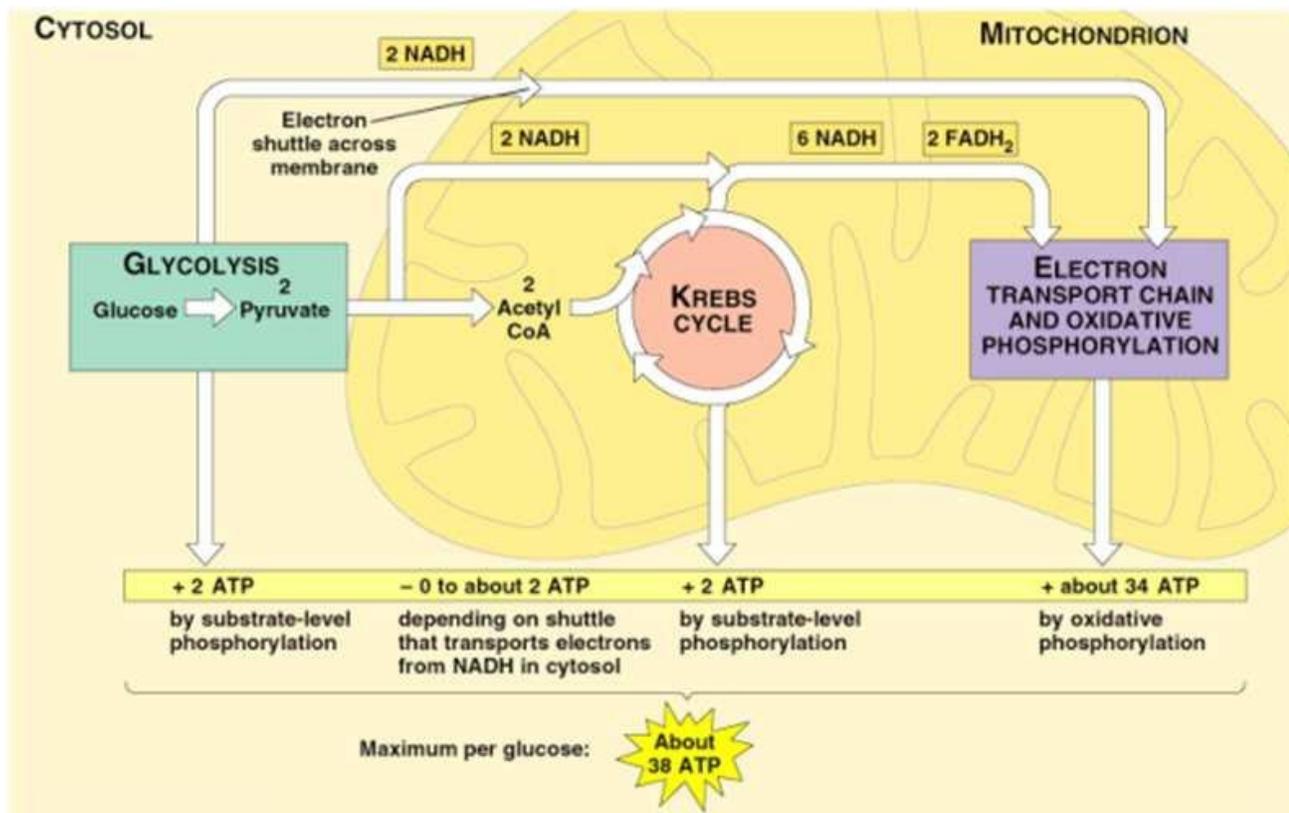
Reaction -

Site -

Structure of mitochondria - draw and label with functions of each part -

Stages – for each stage state where it happens, what it starts with, what it ends with, how it works (describe in a paragraph in your own words, with all the reactants and products involved) -

- 1) Glycolysis
- 2) Krebs Cycle (Citric Acid cycle)
- 3) Electron transport chain (ETC)



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http://highered.mcgraw-hill.com/sites/0072507470/student_view0/chapter25/animation_how_the_krebs_cycle_works_quiz_1.html

http://highered.mcgraw-hill.com/sites/0072507470/student_view0/chapter25/animation_electron_transport_system_and_atp_synthesis_quiz_2.html

Compare and contrast the DNA and RNA using the criteria below -

CRITERIA	RNA (Ribonucleic Acid)	vs.	DNA (Deoxyribonucleic acid)
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Name Sugar (5-Carbon)

Structure (number strands)

Bases (names of all bases present in structure)

Location in cell

Function

Size

Types

PROTEIN SYNTHESIS

Briefly describe the overall process of protein synthesis in your own words. For each of the two steps, give the details requested:

STEP 1 - TRANSCRIPTION

PLACE

Structure responsible

Structure formed

How it happens

STEP 2 - TRANSLATION

Place

Structure responsible

Structure formed

How it happens - use the following words – genetic code, ribosome, codon, anti-codon, mRNA, tRNA, protein

Compare Contrast the two steps of protein synthesis using the criteria below:

Criteria

Transcription

Translation

Location in cell

Product

Structure Responsible

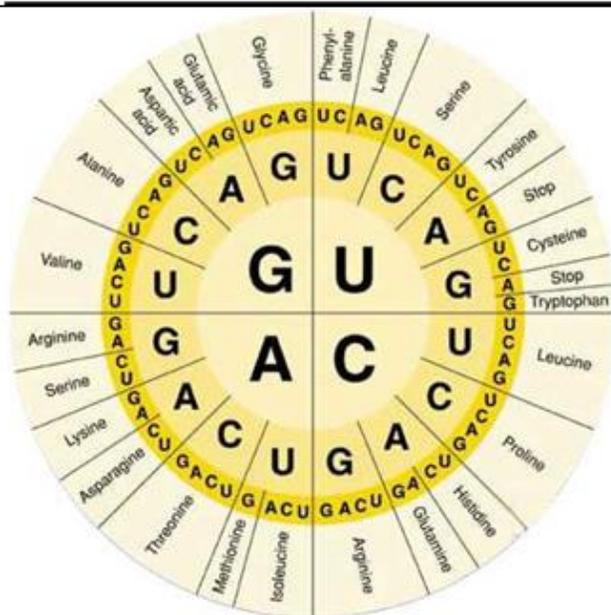
Description of Process

GENETIC CODE – used to read the sequence of amino acids in a protein chain formed from a sequence of bases on the mRNA (codon)

<http://learn.genetics.utah.edu/content/begin/dna/transcribe/>

http://highered.mcgraw-hill.com/sites/0072437316/student_view0/chapter15/animations.html#

Protein Synthesis review – Using the following guideline, answer the questions in your notebook - Genetic Code – What is it and how it is used?



Given the following DNA sequence, derive the (a) complementary mRNA, and the (b) resulting protein (use the first three letters to write the amino acids:

TTTACATGCCACGATACGTAATCG (this is the DNA sequence given)

(a)

(b)

What is the START codon? _____

What are the STOP codons and what is their function?

What does the initial DNA sequence represent?

Examples of proteins

Antibodies - are specialized proteins involved in defending the body from antigens (foreign invaders). One way antibodies destroy antigens is by immobilizing them so that they can be destroyed by white blood cells.

Contractile Proteins - are responsible for movement. Examples include actin and myosin. These proteins are involved in muscle contraction and movement.

Enzymes - are proteins that facilitate biochemical reactions. They are often referred to as catalysts because they speed up chemical reactions. Examples include the enzymes lactase and pepsin. Lactase breaks down the sugar lactose found in milk. Pepsin is a digestive enzyme that works in the stomach to break down proteins in food.

Hormonal Proteins - are messenger proteins which help to coordinate certain bodily activities. Examples include insulin, oxytocin, and somatotropin. Insulin regulates glucose metabolism by controlling the blood-sugar concentration. Oxytocin stimulates contractions in females during childbirth. Somatotropin is a growth hormone that stimulates protein production in muscle cells.

Structural Proteins - are fibrous and stringy and provide support. Examples include keratin, collagen, and elastin. Keratins strengthen protective coverings such as hair, quills, feathers, horns, and beaks. Collagens and elastin provide support for connective tissues such as tendons and ligaments.

Storage Proteins - store amino acids. Examples include ovalbumin and casein. Ovalbumin is found in egg whites and casein is a milk-based protein.

Transport Proteins - are carrier proteins which move molecules from one place to another around the body. Examples include hemoglobin and cytochromes. Hemoglobin transports oxygen through the blood. Cytochromes operate in the electron transport chain as electron carrier proteins.

Topic VIII
The Cell Cycle and Cell Division
Review

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http://highered.mcgraw-hill.com/sites/0072437316/student_view0/chapter12/animations.html

1. The cell cycle is the series of events that occur in order to produce new cells from pre-existing cells. What do you think the original cell needs to do in order to divide into new cells? (think that you start with one cell and you need to end up with two identical cells)

2. What is the difference between a sperm/egg (ovum) cell (called gametes or reproductive cells) and any other cell in the body (skin/blood/muscle cell)?

3. What do you think the difference should be between the production of gametes and of all the other cells?

4. Can a sperm or an egg divide? Why or why not?

5. What is the difference between an individual chromosome and a duplicated chromosome?

6. What is mitosis and its stages with their main characteristics?

Def: _____

Stages: 1. _____

2. _____

3. _____

4. _____

7. What is meiosis and its stages with their names and main characteristics?

Def: _____

Stages: 1. _____

2. _____

3. _____

4. _____

1. _____
2. _____
3. _____
4. _____