

Quizlet

Nature of Science 1-1

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1. **Controlled experiment** an experiment in which all of the variables except for one remain the same
2. **Data** the facts and figures, and other evidence gathered through observation
3. **Hypothesis** an explanation to a set of observations
4. **Inference** an interpretation of an observation that is based on evidence or prior knowledge
5. **Manipulated variable** a variable that is changed in the experiment
6. **Observation** a skill that involves the one or more of the five senses
7. **Responding variable** a factor that changes as a result of the manipulated variable
8. **Science** a way of learning about the natural world and the knowledge gained through that process
9. **Scientific Inquiry** diverse ways in which scientists study the natural world
10. **Scientific Theory** a well tested concept that explains a wide range of observations
11. **Variables** any factor that can change during an experiment

Quizlet

What is Life 1-1

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1. **autotroph** an organism that makes its own food
2. **heterotroph** organism that cannot make its own food
3. **spontaneous generation** the mistaken idea that living things arise from non-living things

Quizlet

Parts of a microscope

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1. **body tube** allows light from the objective lens to pass upward to form the first magnified image
2. **low power objective lens** lowest power lens 4x magnification use this FIRST
3. **medium objective lens** middle power usually 10x or 25x magnification, use this second
4. **high objective lens** highest power usually 40x use this last
5. **stage** the platform that supports the specimen. Has hole in center to let light pass through.
6. **coarse adjustment knob** larger knob moves the stage to focus the specimen. DO NOT USE WITH HIGHEST POWER. MOVE SLOWLY
7. **fine adjustment knob** used to bring the specimen into final focus.
8. **Light Source** Light bulb or mirror that provides light to pass through specimen

Quizlet

Scientific Classifications

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1. **3 domains** Eukarya Archaea Bacteria
2. **6 kingdoms** Eubacteria Archaeobacteria Protista Plantae Fungi Animalia
3. **Bacteria** Peptidoglycan in cell membrane
4. **binomial nomenclature** each organism is given a two part name
5. **taxonomic key** a series of paired statements that describe the physical characteristics of different organisms

Quizlet

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1. **cell membrane** lipid and protein layer around a cell. Protects allows materials to pass in and out. All cell have a membrane
2. **cell wall** PLANTS ONLY protects the cell and regulates what substances enter and leave the cell.
3. **endoplasmic reticulum** rough (sheets) or smooth (tubes) found throughout cell connected to nucleus. Rough ER make proteins pass to golgi bodies. Smooth ER store lipids and steroids
4. **eukaryotes** cell that has a nucleus and organelles
5. **golgi bodies** stack of membrane (pancakes) receives proteins from Rough ER puts them together and ships out to the cell
6. **mitochondria** rod shaped structures located in the cytoplasm breaks down nutrients converts to energy
7. **nucleus** larger round structure toward the middle of a cell. contains DNA RNA nucleolus
8. **prokaryotes** cells that do not have a nucleus or organelles
9. **ribosomes** grain-like found in cytoplasm or endoplasmic reticulum. Protein builders

Quizlet

Cell Theory

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1. **Antony Van Leeuwenhoek** Made microscope observed pond water. Saw "animalcules" little animals (unicellular). observed teeth scrapings. Saw bacteria
2. **Robert Hooke** Observed piece of cork through home-made microscope. Used word CELLS
3. **Virchow** Inferred new cells can only come from existing cells. "All cells come from cells"

Quizlet

Cell Process and Energy

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1. **Active Transport** the movement of material through a membrane using energy
2. **atom** the smallest unit of an element
3. **carbohydrates** energy rich organic compound made of carbon, hydrogen, and oxygen. raw materials for cell parts. sugars and starches
4. **compound** when two or more different elements are chemically combined
5. **diffusion** The process by which molecules tend to move from an area of higher concentration to lower concentration
6. **DNA** deoxyribonucleic acid. Genetic material that carries information about an organism
7. **element** a substance that cannot be broken down into simpler substance; all the atoms are the same
8. **molecule** the smallest unit of most compounds. Two or more atoms bonded together
9. **nucleic acid** large organic molecule made of hydrogen, carbon, oxygen nitrogen, and phosphorus
10. **osmosis** the diffusion of a fluid, usually water, through a membrane. From high concentration to lower concentration
11. **Passive Transport** the movement of material through a cell membrane without using energy
12. **protein** large organic molecules made of carbon, hydrogen, oxygen, nitrogen, and sometimes sulfur. Used for tissue growth and repair
13. **RNA** Help in the production of proteins
"Ribonucleic Acid"
14. **Selectively Permeable** Some substances can pass through cell membrane while others cannot

Quizlet

Genetics

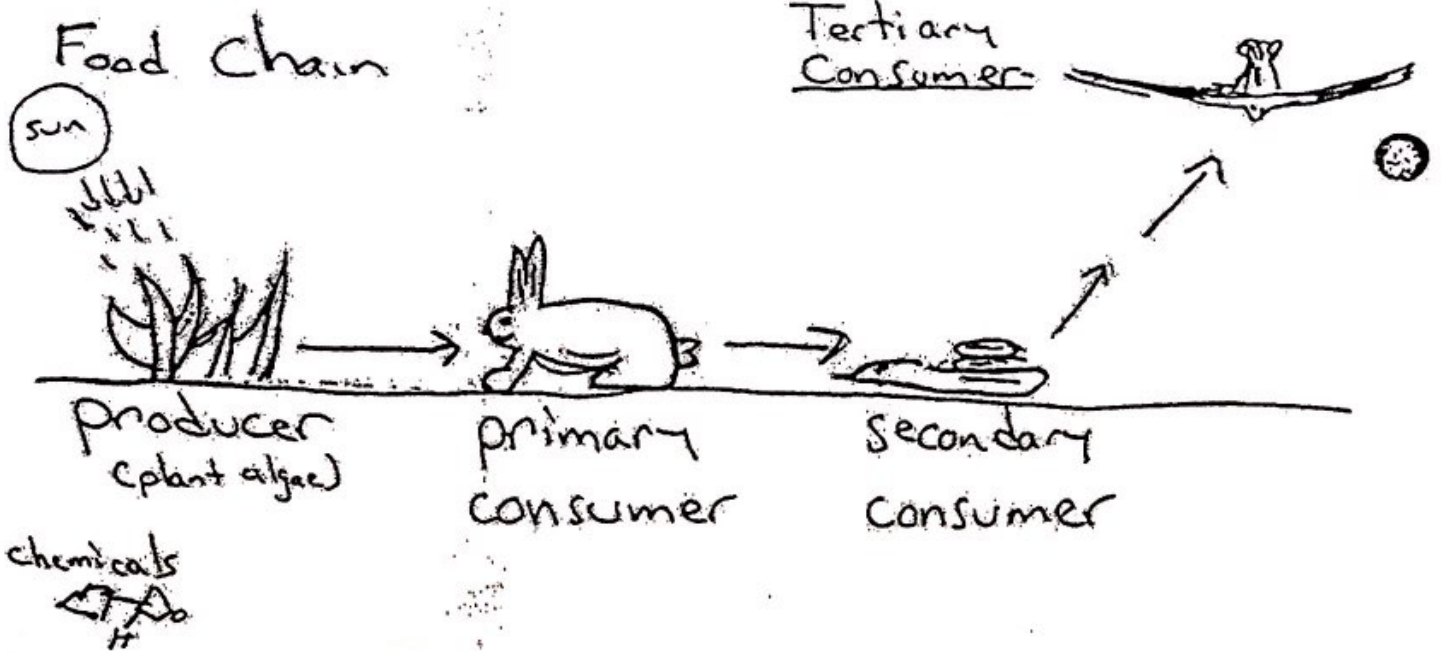
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1. **Dominant Allele** trait always shows up when present in an organism
2. **Genotype** allele combinations
3. **Heredity** The passing of traits from the parent to offspring
4. **Heterozygous** genotype that has two different alleles
5. **Homozygous** genotype that has two identical alleles for a trait
6. **Phenotype** visible trait, physical appearance
7. **Punnett square** a chart that shows all the possible combinations of alleles that could result from genetic crossings

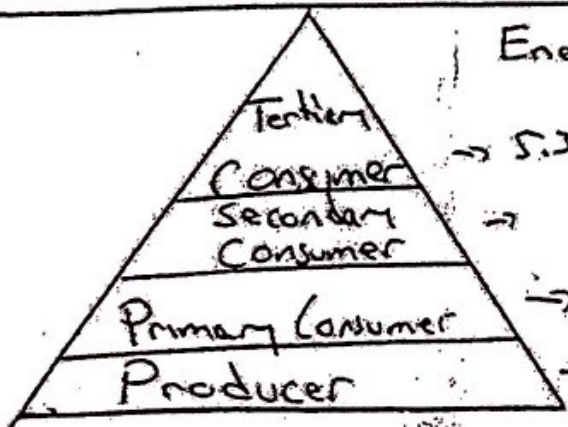
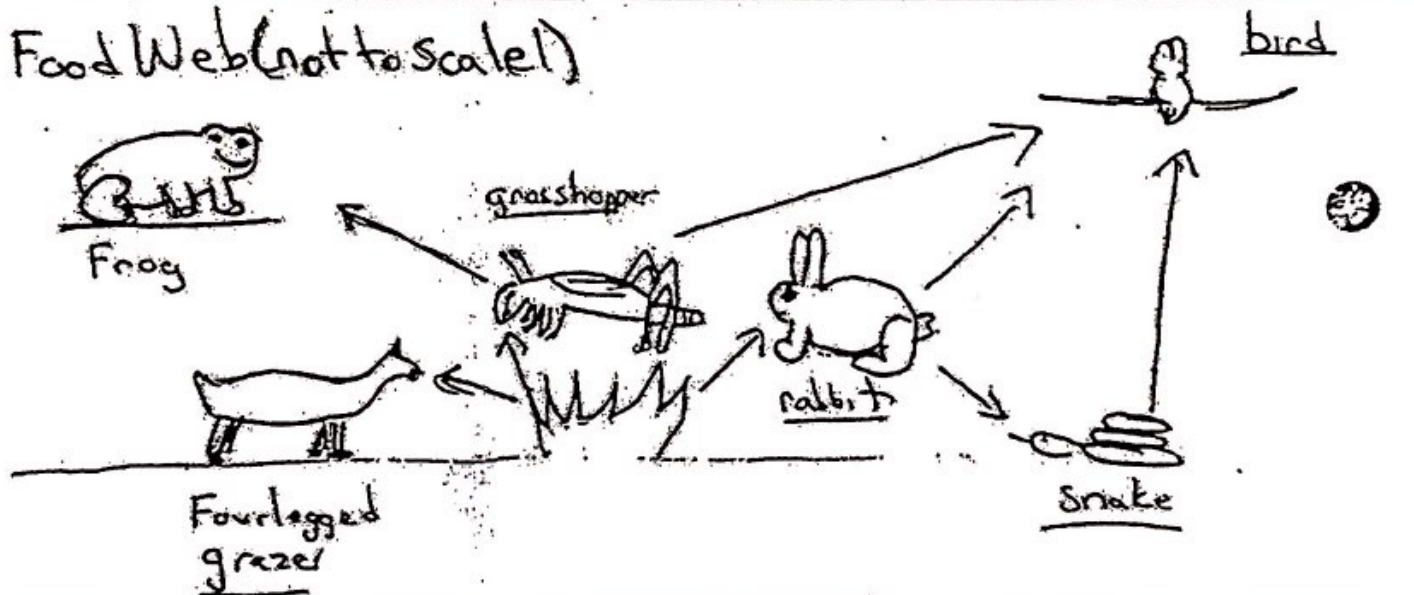
Quizlet Ecology

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1. **Abiotic Factor** Non-living parts of an ecosystem
2. **Abiotic Factor examples** wind, rain, soil, temperature, sunlight
3. **Biotic Factor** Living parts of an ecosystem
4. **Biotic Factor Examples** hawk, lady bug, grass, trees, bacteria, ants, lobster, coral, etc.
5. **Commensalism** A type of symbiotic relationship where one of the organisms benefits and the other is not harmed
6. **Community** All the different populations in a community
mice, ladybugs, garter snakes, worms, etc.
7. **Determining Population Size**
Direct Observation
Indirect Observation
Sampling
Mark and Recapture
8. **Habitat** a place where an organism lives and that provides the things the organism needs
9. **Mutualism** A type of symbiotic relationship where both organisms benefit
10. **Parasitism** A type of symbiotic relationship where one of the organisms benefits and the other is harmed



Food Web (not to scale)



Energy Pyramid

→ 5,348 kilocal

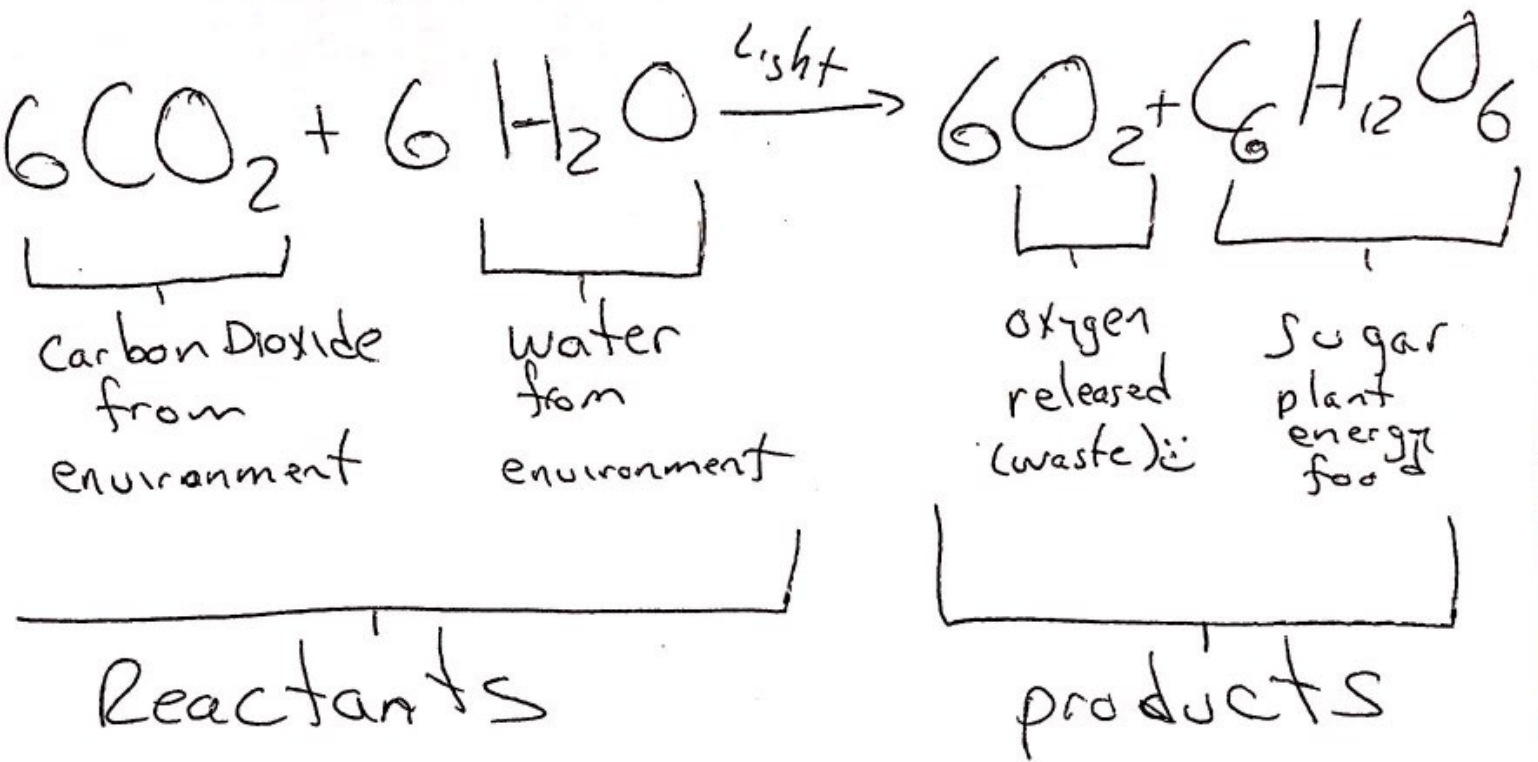
→ 53,48 kilocal

→ 534.8 kilocal

→ 5,348 kilocal

Only 10% of the energy moves to the next level

Photosynthesis Formula



Photosynthesis Reactants

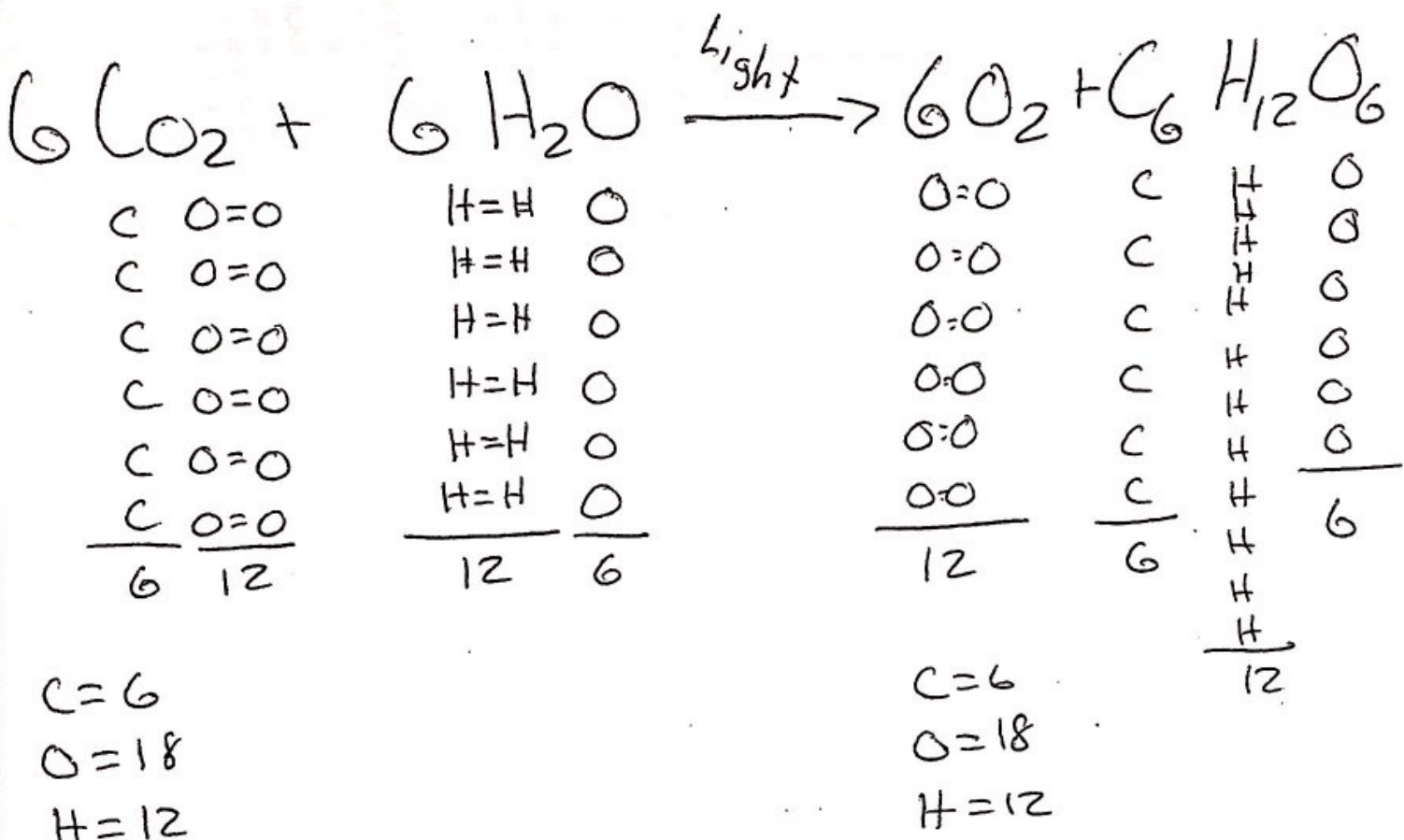
- Carbon dioxide
- water

Photosynthesis Products

- oxygen
- sugar

Said: "Six Carbon dioxide plus 6 water in the presence of light yields 6 oxygen and sugar"

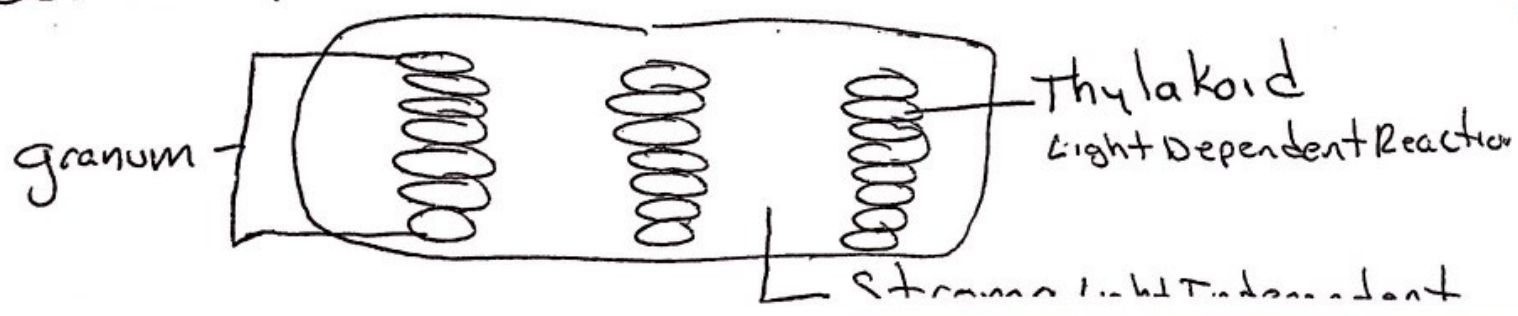
Photosynthesis is Balanced



Photosynthesis is a 2 step process

1. Light dependent reaction - needs light
2. Light independent reaction - does not need light
 "Dark Reaction"
 "Calvin Cycle"

Both steps take place in the chloroplast



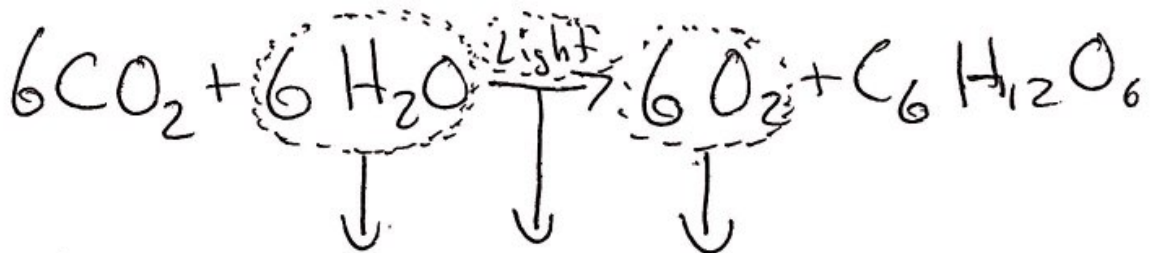
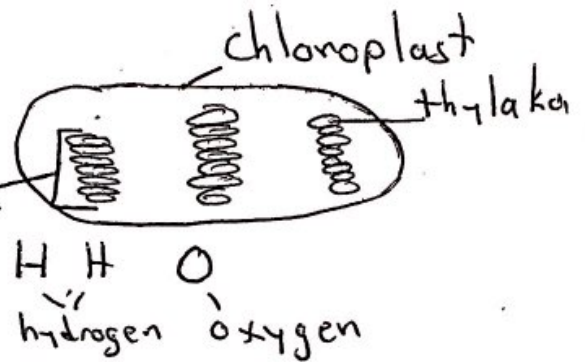
PHOTOSYNTHESIS

Steps

1. Light Dependent Reaction - needs light
2. Light Independent Reaction - does not need light
 - Dark reaction
 - Calvin cycle

Light Dependent Reaction

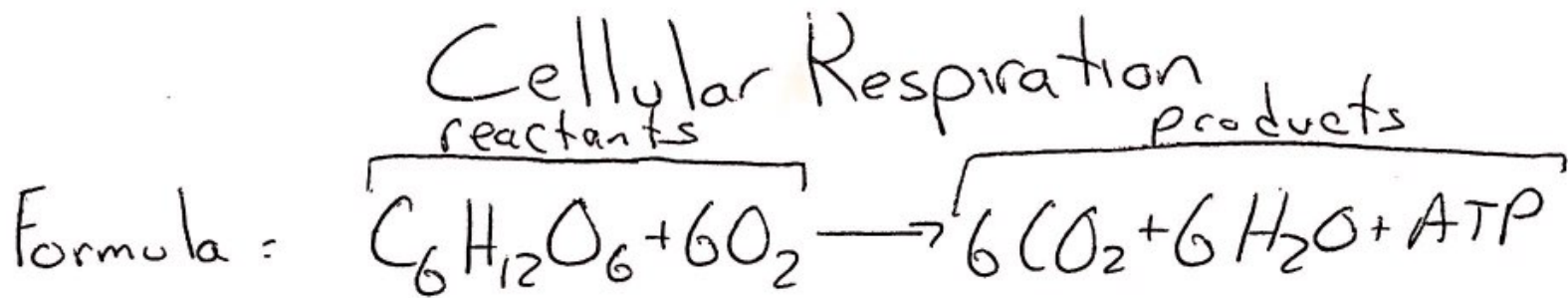
- In chloroplast - thylakoid granum
- Light helps "cut" water H_2O
 - H is kept
 - O is released
- ATP
NADPH } created and passed onto dark reaction



Light Independent Reaction

- The above molecules and light are involved in the Light Independent Reaction
- The Carbon dioxide and glucose will be involved in the Light Independent Reaction (Dark Reaction) (Calvin cycle)

Cellular Respiration



3 Step Process

1 Glycolysis

2 Krebs's Cycle or "Citric Acid Cycle"

3 Electron Transport Chain

Step 1: Glycolysis

- happens in cytoplasm outside the mitochondria

- does not need oxygen = anaerobic

- $C_6H_{12}O_6$ broken down: 2 pyruvates \rightarrow $\begin{array}{c} O^- \\ | \\ C=O \\ | \\ C=O \\ | \\ CH_3 \end{array}$

2 ATP

2 NADH

(used to transfer electrons later)

Step 2: Krebs Cycle or Citric Acid Cycle

- happens in mitochondria

- requires oxygen = aerobic

- O_2 is fixed to pyruvates

- makes CO_2 6 more NADH 2 FADH₂

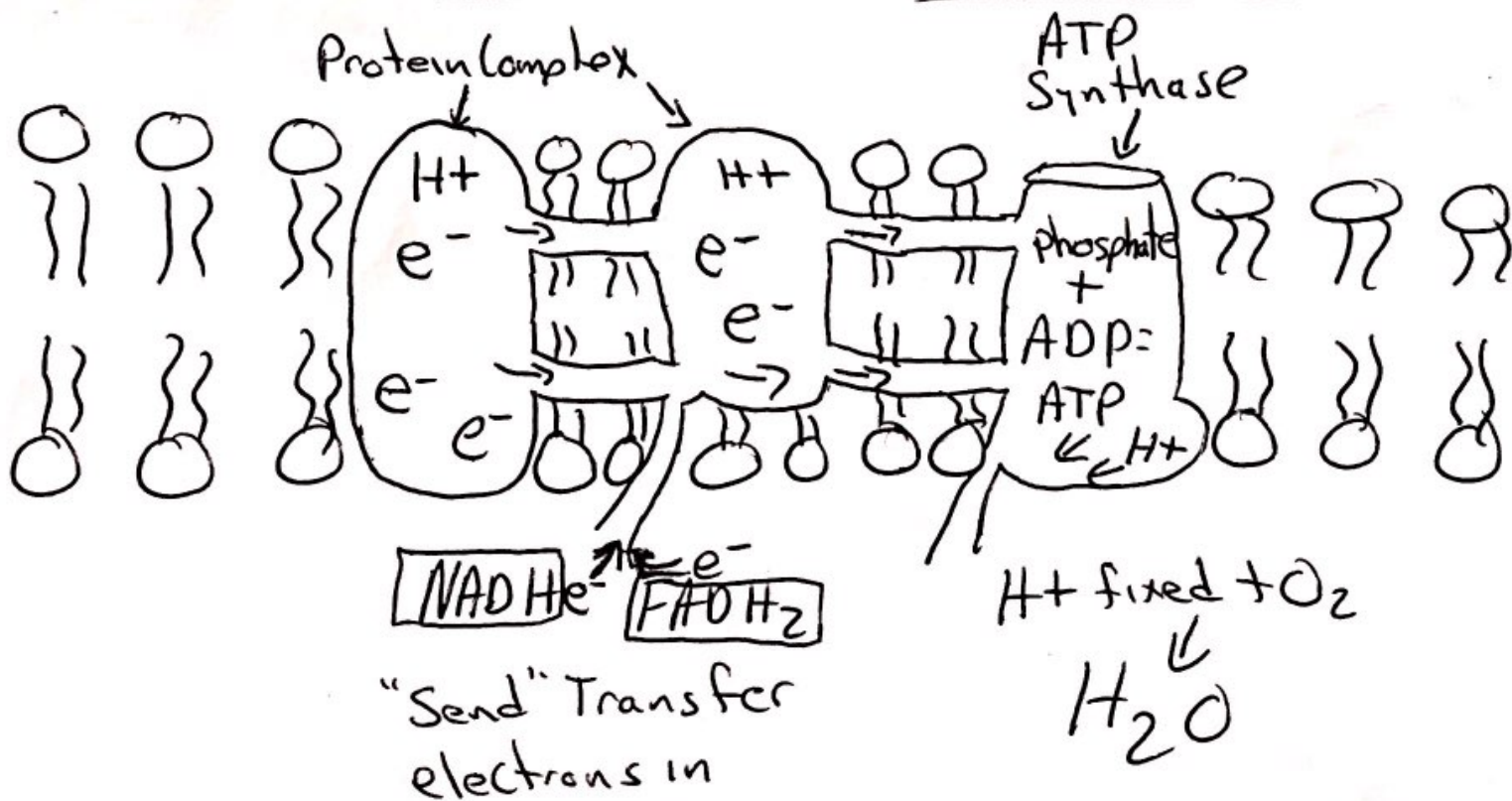
2 more ATP

(transfer electrons) (Also transfer electrons)

Step 3 : Electron Transport Chain

- happens in membrane of the mitochondria
- oxygen needed = aerobic
- electrons from NADH and FADH₂ are transferred through special proteins in the membrane
- Protons (H⁺) move across membrane toward ATP Synthase - special enzyme in the membrane
- In ATP Synthase - a phosphate is added to ADP forming ATP
- Oxygen combines with H⁺ to make H₂O
- makes a total of 32-38 ATP

Mitochondria Membrane



fermentation

why do fermentation? No or low oxygen
No mitochondria

Two Types of fermentation

1. Lactic Acid
2. Alcoholic

1. Lactic Acid

- glycolysis $\left\{ \begin{array}{l} \text{sugar converted to pyruvates} \\ \text{NADH created} \end{array} \right.$
- H removed from NADH leaving NAD⁺
- H is fixed onto pyruvate forming Lactate (lactic acid)
- ATP created
- NAD⁺ is recycled

2. Alcoholic

- glycolysis $\left\{ \begin{array}{l} \text{sugar converted to pyruvates} \\ \text{NADH is created} \end{array} \right.$
- H is removed from NADH leaving NAD⁺
- H fixed to pyruvate forming ethyl alcohol
- ATP formed CO₂ released
- NAD⁺ is recycled

Lactic Acid

You perform this when you are doing extreme exercises "feel the burn" lactic acid

Alcoholic

Used in wine making yeast convert sugar to alcohol

Interphase



- DNA begins to duplicate
- Developing
 - making more cytoplasm
 - making more organelles
- Growing cell getting bigger

n - mitochondria

v - vacuole

l - lysosome

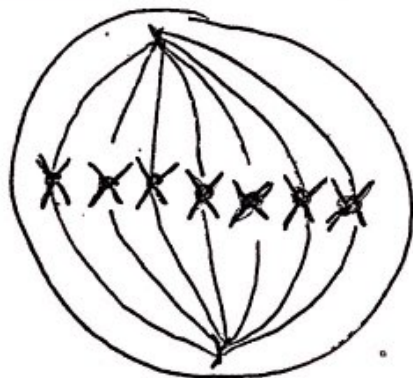
er - endoplasmic reticulum

gb - golgi body

> single chromatid

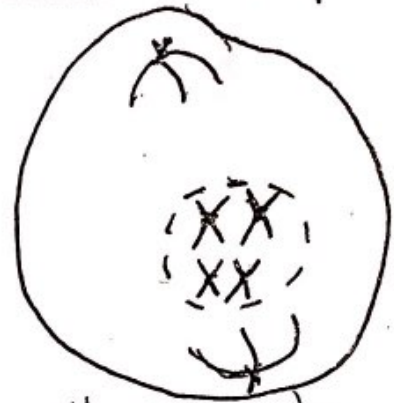
x - sister chromatid

Mitosis - Meta phase



- DNA move toward center of cell
- Spindle fibers attach to centromeres
- Anase is over as soon as chromosomes begin retract
- 46 chromosomes 92 chromatid

Mitosis - Prophase



- All organelles made
- Nuclear membrane dissolves
- All DNA duplicated
- Centrioles form and move toward poles
- Spindles begin to form
- Chromosomes begin to flow into cytoplasm
- 46 chromosomes 92 chromatid

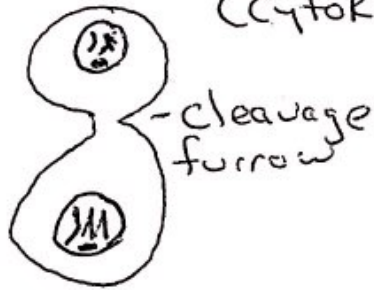
Mitosis - Ana phase (cytokinesis)



- Cleavage Furrow

- Separated chromatid move toward centrioles
- Spindle fibers retract
- Chromatids move toward centrioles
- cell membrane begins to "pinch"

Mitosis - Telophase (Cytokinesis)

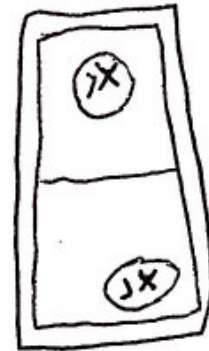


- Nuclear membranes form
- Nuclei form
- Chromatid begin to straighten
- Nucleolus begin to form
- Cell membrane pinches in more

Cytokinesis



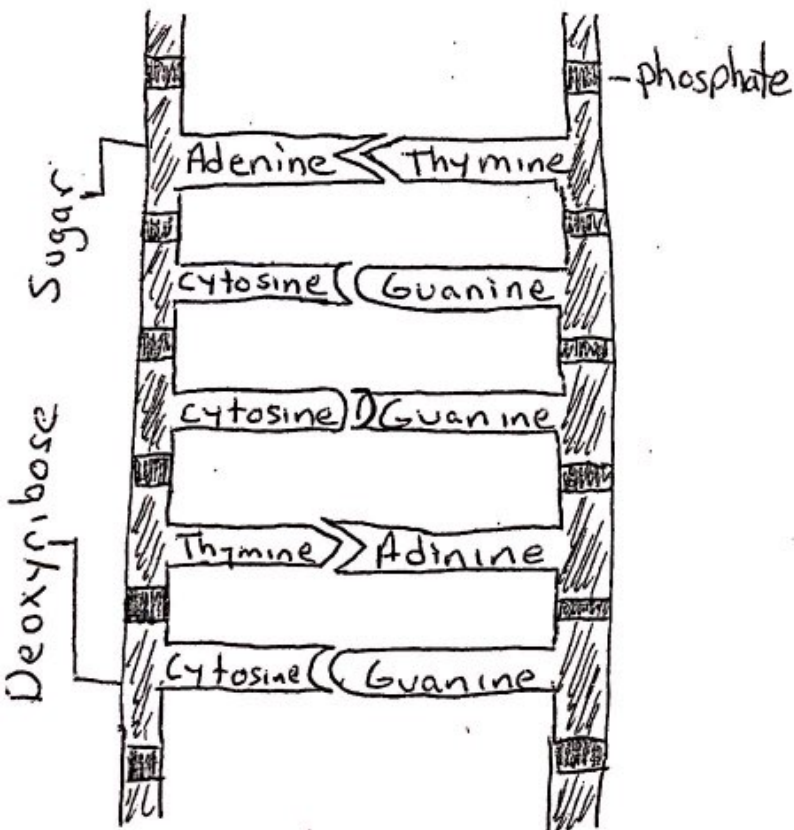
- 2 daughter cells
- Nuclei and structures grow and develop
- Interphase begins



- too rigid for cell wall to "pinch" in
- cell plate forms to separate daughter cells

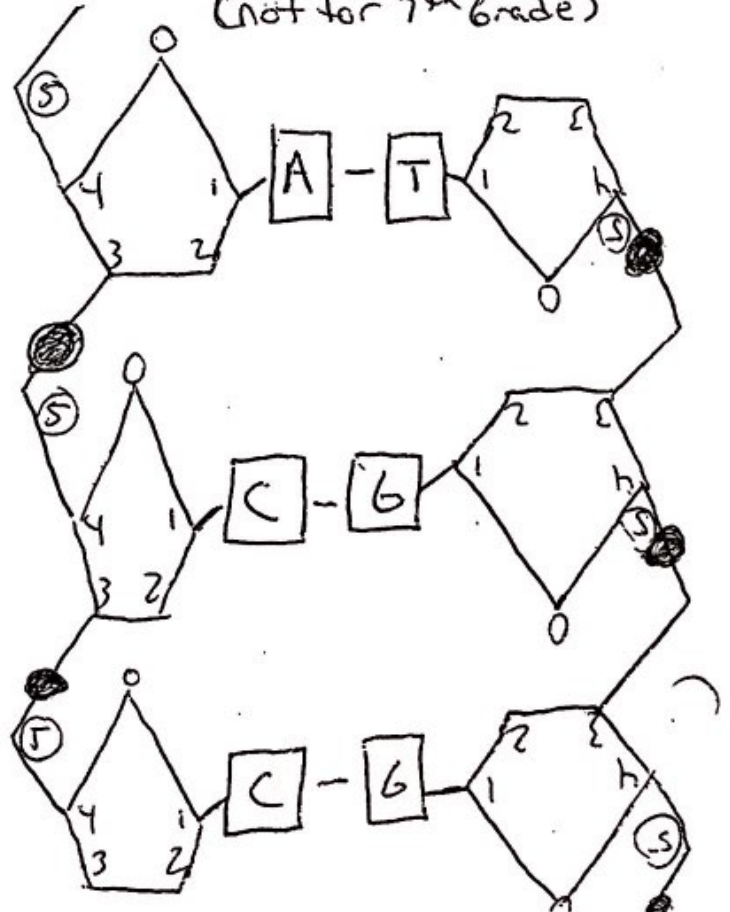
DNA Duplication

Know This

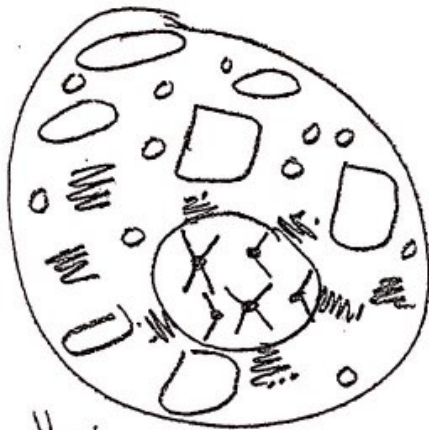


DNA Duplication

(not for 7th grade)



Interphase (meiosis)



1. Organelles Duplicate
2. Cytoplasm increases
3. Grows Develops

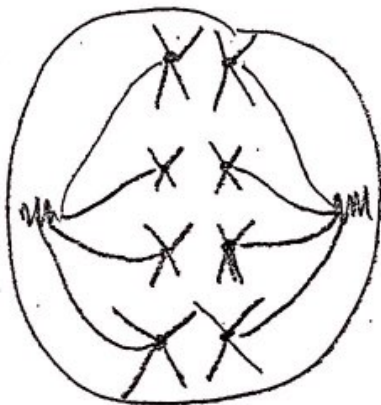
Meiosis + Prophase I M A T



1. All chromatid duplicated
46 chromosomes = 92 chromatid
2. Chromosomes begin to find their homologous pair -genetical similar chromosomes
3. Cross over may occur - swapping genes - diversity
4. Centrioles/spindle fibers

meiosis I

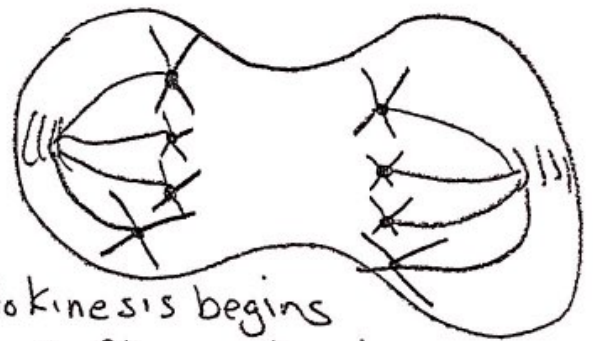
P Metaphase I A T



1. Homologous pairs line up in middle
2. Spindle fibers attaching
3. 46 chromosomes = 92 chromatid

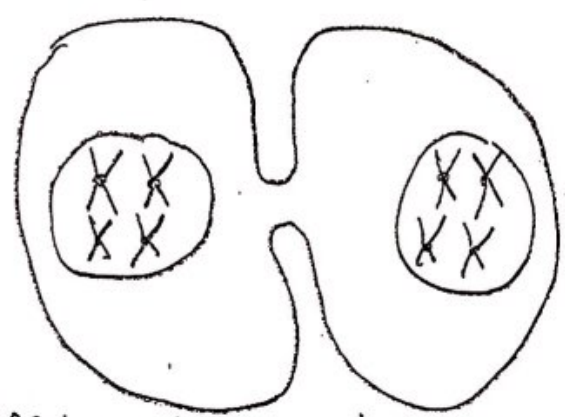
meiosis I

P M Anaphase I T (Cytokinesis)

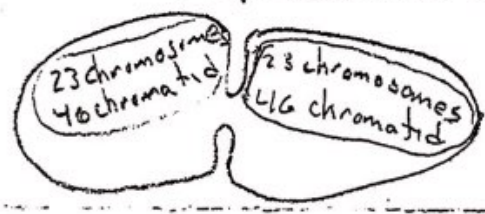


1. Cytokinesis begins
2. Spindle fibers retract
3. 23 chromosomes going toward each pole. = 46 chromatid toward each pole.

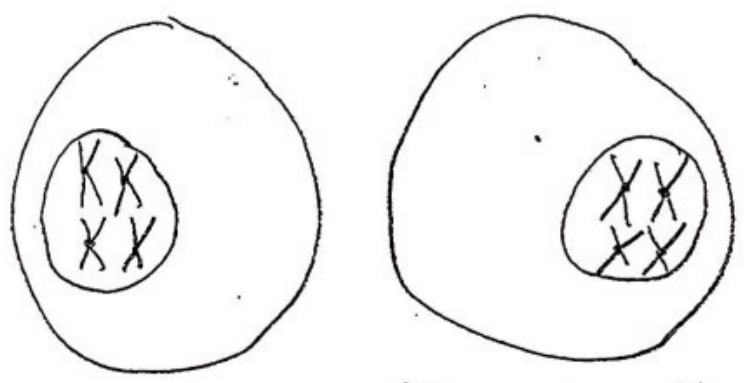
P M A Telophase I



1. Cleavage Furrow deepens
2. Nuclear Membrane returns
3. Nucleolus Returns
4. Centrioles / Spindle fibers gone



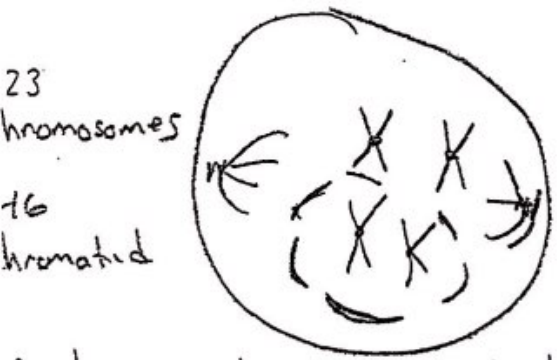
Cytokinesis



- 1 Genetically different cells
- 2 called gametes

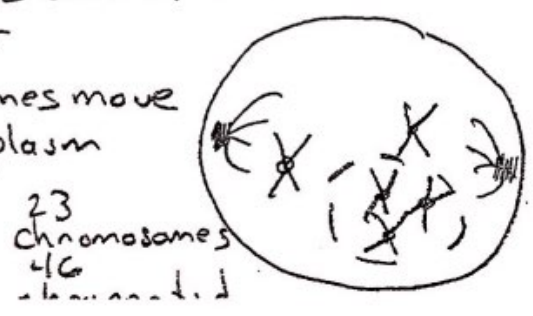
meiosis II

Prophase II M A T



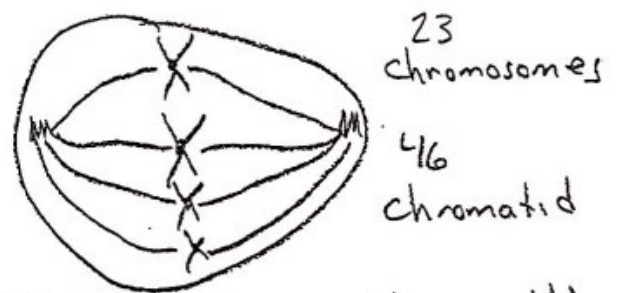
- Nuclear Membranes begin to break down again.
Centrioles and Spindle fibers reappear

Chromosomes move into cytoplasm



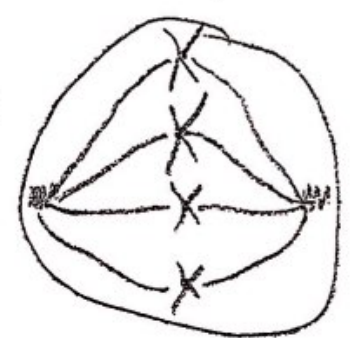
Meiosis II

P Metaphase II A T



1. chromosomes line up in the middle
- 2 Spindle fibers attaching to centromeres

23 chromosomes
46 chromatid

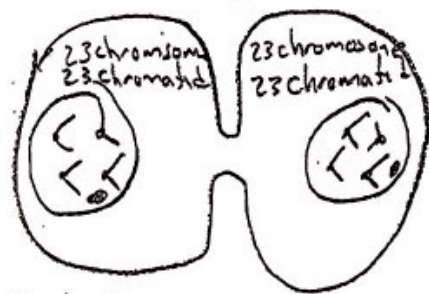


meiosis II

meiosis II

P M Anaphase II T

P M A Telophase (cytokinesis)

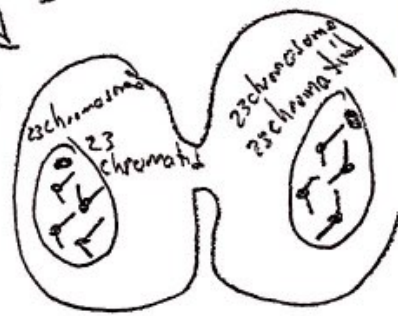


1. Chromosomes pulled apart by retracting spindle fibers

1. Cytokinesis continues
2. Nuclear membrane returns
3. Nucleolus returns
4. Centrioles and spindle fibers gone

2. 23 chromosomes 23 chromatid

3. 23 chromosomes 23 chromatid

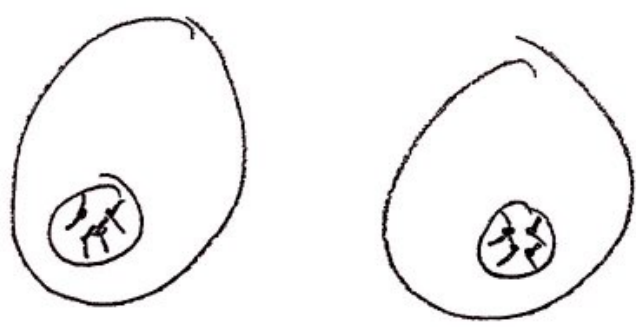
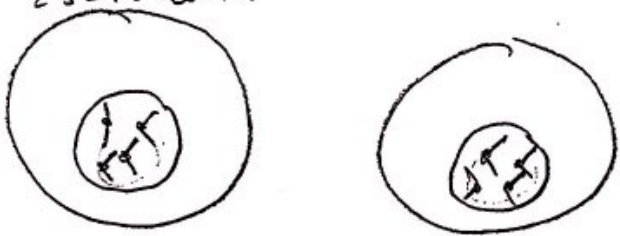


1. Cytokinesis begins

23 chromosomes 23 chromatid

Cytokinesis

23 chromosomes 23 chromatid



Tall vs Short Plant Height

phenotype: Plant height

genotype: T tall - dominant allele
t short - recessive allele

TT: homozygous / purebred / Tall
Tt: heterozygous / hybrid / Tall
tt: homozygous / purebred / short

} possible allele combination

Scenario #1 Tall purebred plant crossed with tall hybrid plant

Punnett Square

	T	T
T	TT	Tt
t	Tt	tt

represents probability of offspring

100% Tall
50% homozygous
50% heterozygous

Scenario #2 Tall hybrid plant crossed with a homozygous short plant.

	T	t
t	Tt	tt
t	Tt	tt

Probability
50% Tall: heterozygous (Tt)
50% Short: homozygous (tt)

Creating an F₁ and F₂ Generation

"Parent" Group or P₁ generation

phenotype: yellow or green leaves

Dominant: yellow = Y

Recessive: green = y

possible Allele

YY = yellow

Yy = yellow

yy = green

Parent Group: heterozygous crossed with a green leaf plant

	Y	y
y	Yy	yy
y	Yy	yy

P₁

50% heterozygous yellow (Yy)

50% homozygous green (yy)

F₁ generation is the crossing of two of the offspring from the Parent Group. Choosing to cross Yy and Yy

	Y	y
Y	YY	Yy
y	Yy	yy

50% heterozygous yellow (Yy)

25% homozygous yellow (YY)

25% homozygous green (yy)

F₂ generation is the crossing of two of the offspring from the F₁ generation. Choosing to cross YY and Yy

	Y	Y
Y	YY	YY
y	Yy	Yy

50% heterozygous yellow (Yy)

50% homozygous yellow (YY)

Codominant

Codominance - neither allele is dominant nor recessive

Phenotypes Black feathers
 White feathers
 Black/White feathers

All capital letters (genotype)
 $F^B F^B$ = black feathers
 $F^W F^W$ = white feathers
 $F^B F^W$ = Black/White feathers

Crossing a black feather chicken with a white feather chicken

	F^B	F^B (black)
F^W (white)	$F^B F^W$	$F^B F^W$
F^W	$F^B F^W$	$F^B F^W$

Phenotype of offspring both black/white
 Genotype $F^B F^W$

Crossing a black and white chicken with a white chicken

	F^B	F^W (black/white)
F^W (white)	$F^B F^W$	$F^W F^W$
F^W	$F^B F^W$	$F^W F^W$

50% Black and white $F^B F^W$
 50% white $F^W F^W$

Incomplete Dominance

Incomplete Dominance - when two organisms are crossed and it is possible to see a new phenotype

Phenotypes: color of petals on a flower: white, red.

Genotypes: $WW = \text{white}$
 $RR = \text{red}$

Crossing an incomplete dominant Red plant with an incomplete dominant White plant.

(white) ↓ W	R	R	(red)
W	RW	RW	phenotype: of offspring = pink Genotype: RW 100% pink
W	RW	RW	

P1

Creating an F1 generation

	R	W	
R	RR	RW	(1) RR = red 25%
W	RW	WW	(2) RW = pink 50% (1) WW = white 25%

Creating an F2 generation

	R	R	
R	RR	RR	(2) RR = red 50%
W	RW	RW	(2) RW = pink 50%

Blood Types

Codominant I i

$AA = I^A I^A$
 $BB = I^B I^B$
 $OO = i i$
 $AB = I^A I^B$
 $AO = I^A i$
 $BO = I^B i$

"I" represents "blood" A or B represents type of blood

"i" represents type "O" blood

$I^A I^A$ = you say "Type A blood"
 $I^B I^B$ = you say "Type B blood"
 $I^A I^B$ = you say "Type AB blood"
 $I^A i$ = you say "Type AO blood"
 $i i$ = you say "Type O blood"

Blood Type is Genetic
you inherit your blood type from your parents

Mom Type "A"

	I^A	I^A
dad Type B I^B	$I^A I^B$	$I^A I^B$
I^B	$I^A I^B$	$I^A I^B$

100% probability all offspring will be Type AB

Mom type AO

	I^A	i
dad Type B I^B	$I^A I^B$	$I^B i$
I^B	$I^A I^B$	$I^B i$

50% AB
50% BO

Sex Linked Traits

Humans have 46 chromosomes. One pair (2) chromosomes determine the gender of a person.

$$\underbrace{XX}_{\text{Chromosome}} = XX = \text{female}$$

$$\underbrace{X \overset{\text{smaller}}{Y}}_{\text{Chromosome}} = XY = \text{male}$$

- Some traits are sex linked = linked or attached to the sex chromosomes that determine the gender
- Hemophilia is sex linked. H = dominant = no hemophilia
 h = recessive = hemophilia
- $X^H X^H$ = female homozygous = no hemophilia
- $X^H X^h$ = female heterozygous = no hemophilia
- $X^h X^h$ = female homozygous = hemophilia
- $X^H Y$ = male = no hemophilia
- $X^h Y$ = male = hemophilia

Sex linked traits mostly only on X chromosome

Sex Linked Punnet Squares

Mom is homozygous for not having hemophilia



Dad has hemophilia



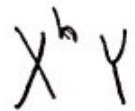
	X^H	X^H
X^h	$X^H X^h$	$X^H X^h$
Y	$X^H Y$	$X^H Y$

50% female heterozygous no hemophilia
50% male no hemophilia

Mom is heterozygous for not having hemophilia



Dad has hemophilia



	X^H	X^h
X^h	$X^H X^h$	$X^h X^h$
Y	$X^H Y$	$X^h Y$

1 female heterozygous no hemophilia
1 female homozygous has hemophilia
1 male no hemophilia
1 male has hemophilia

Mom is heterozygous for not having hemophilia $X^H X^h$
Dad does not have hemophilia $X^H Y$

	X^H	X^h
X^H	$X^H X^H$	$X^H X^h$
Y	$X^H Y$	$X^h Y$

1 daughter homozygous no hemophilia
1 daughter heterozygous no hemophilia
1 son no hemophilia
1 son with hemophilia

Pedigree

○ = Female that does not display the trait ($X^H X^H$)

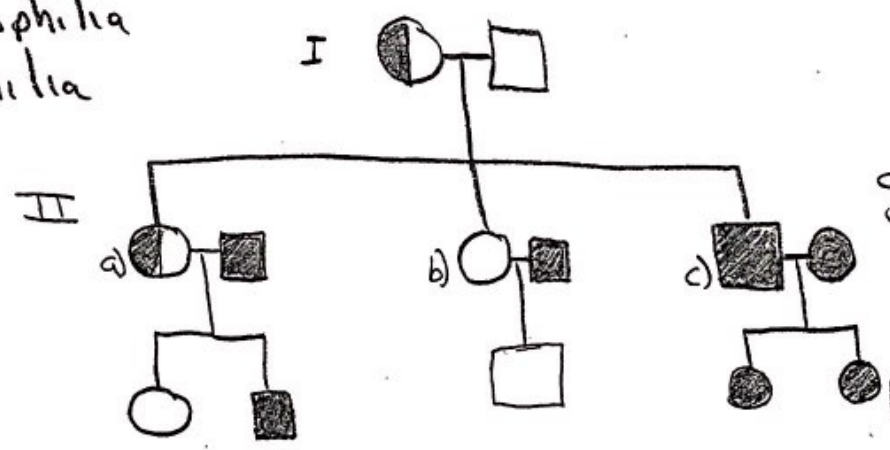
◐ = Female that does not display the trait ($X^H X^h$) but is a carrier

● = Female that displays the trait ($X^h X^h$)

□ = Male that does not display the trait ($X^H Y$)

■ = Male that does display the trait ($X^h Y$)

H nohemophilia
h hemophilia



	X^H	X^h
X^H	$X^H X^H$	$X^H X^h$
X^h	$X^H X^h$	$X^h X^h$
Y	$X^H Y$	$X^h Y$

girls 100% probability nohemophilia
50% probability of being a carrier
boys 50% probability of hemophilia

IIa

	X^H	X^h
X^H	$X^H X^H$	$X^H X^h$
X^h	$X^H X^h$	$X^h X^h$
Y	$X^H Y$	$X^h Y$

girls - 50% chance hemophilia
boys - 50% chance hemophilia

IIb

	X^H	X^H
X^H	$X^H X^H$	$X^H X^H$
X^h	$X^H X^h$	$X^H X^h$
Y	$X^H Y$	$X^H Y$

girls: 100% chance nohemophilia
100% chance carrier
boys: 100% chance nohemophilia

IIc

	X^h	X^h
X^H	$X^H X^h$	$X^H X^h$
X^h	$X^h X^h$	$X^h X^h$
Y	$X^h Y$	$X^h Y$

girls 100% chance hemophilia
boys 100% chance hemophilia

Protein Synthesis

mRNA - messenger RNA

tRNA - transfer RNA

rRNA - ribonucleic acid

transcription - transcribing - coding of DNA to make mRNA

- no Thymine - replaced by Uracil

- "Unicorns eat apples"

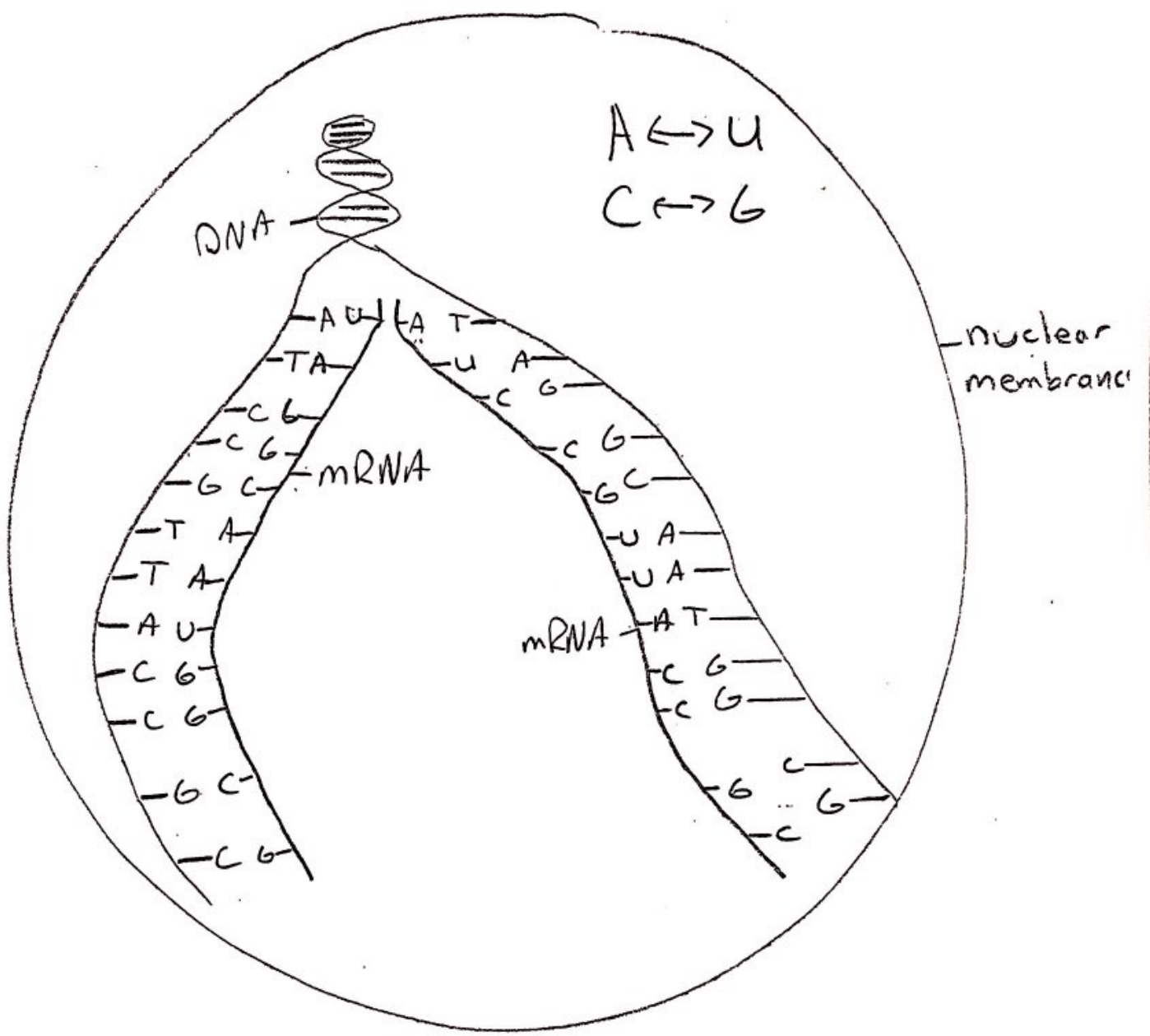
- $A \leftrightarrow U$ $C \leftrightarrow G$

translation - tRNA reading the mRNA and "translating" that into the correct chain of amino acids

Codon - set of 3 nucleic bases on the mRNA that code for a particular amino acid

anti codon - set of 3 nucleic bases on the tRNA that carry or transfer the amino acids.

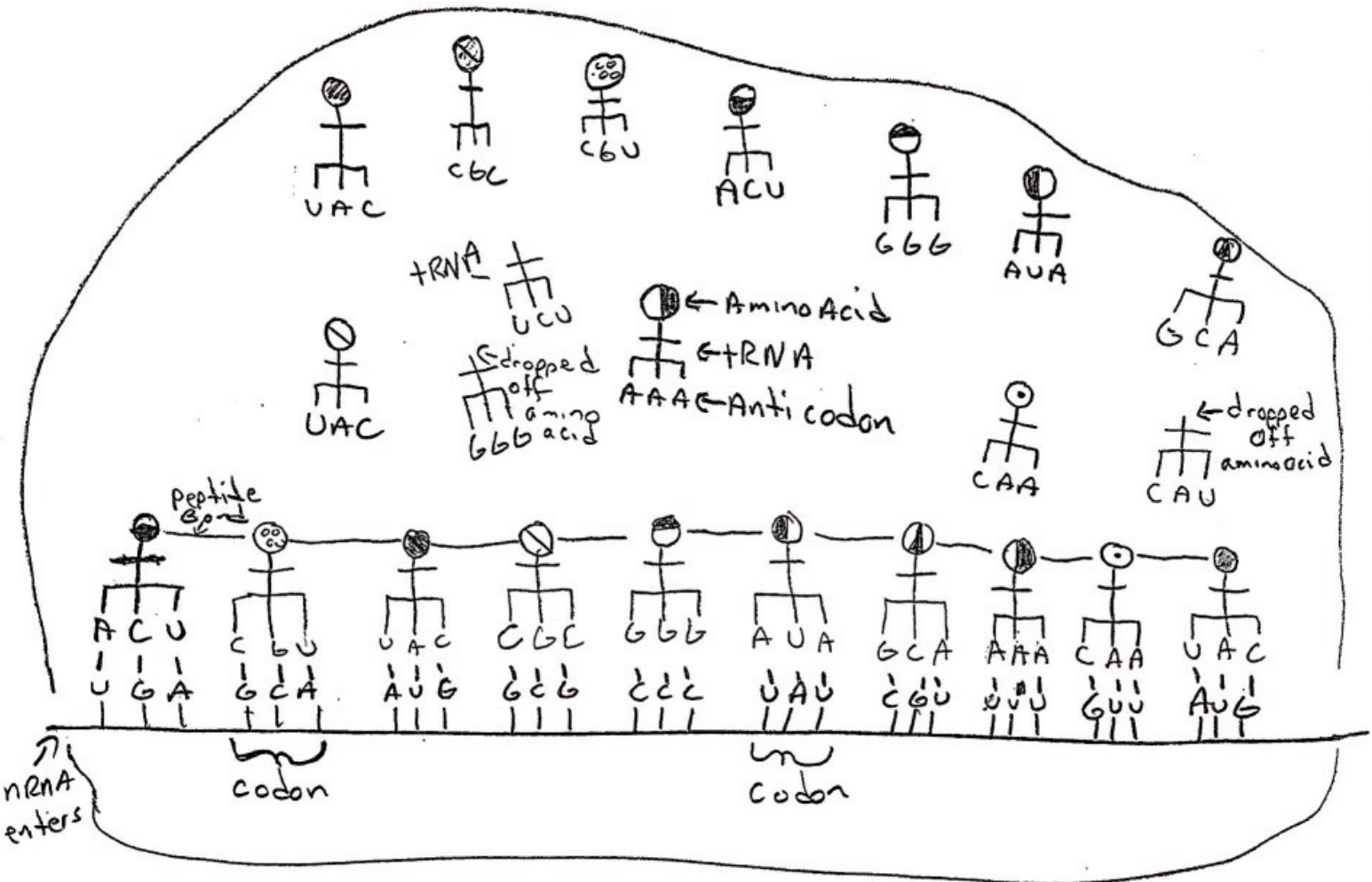
Inside Nucleus



mRNA - leaves the nucleus and goes to ribosomes.
- enters ribosome to be coded

Adenine (Uracil)
Cytosine (Guanine)

Inside Ribosome



tRNA - transfer RNA "T"

● - amino acid

⌈
mm - anti codon

mRNA - messenger RNA

CGC UAU - codon

● — ● — ● - chain of amino acids protein
↑ ↑
peptide bonds

mRNA Codon/Amino Acid Chart

First Base	Second Base				Third Base
	U	C	A	G	
U	UUU } Phenylalanine (Phe) UUC } UUA } Leucine (Leu) UUG }	UCU } UCC } Serine (Ser) UCA } UCG }	UAU } Tyrosine (Tyr) UAC } UAA } Stop UAG }	UGU } Cysteine (Cys) UGC } UGA - Stop UGG - Tryptophan (Trp)	U C A G
C	CUU } CUC } Leucine (Leu) CUA } CUG }	CCU } CCC } Proline (Pro) CCA } CCG }	CAU } Histidine (His) CAC } CAA } Glutamine (Glu) CAG }	CGU } CGC } Arginine (Arg) CGA } CGG }	U C A G
A	AUU } AUC } Isoleucine (Ile) AUA } AUG - Start Methionine (Met)	ACU } ACC } Threonine (Thr) ACA } ACG }	AAU } Asparagine (Asn) AAC } AAA } Lysine (Lys) AAG }	AGU } Serine (Ser) AGC } AGA } Arginine (Arg) AGG }	U C A G
G	GUU } GUC } Valine (Val) GUA } GUG }	GCU } GCC } Alanine (Ala) GCA } GCG }	GAU } Aspartic Acid (Asp) GAC } GAA } Glutamic Acid (Glu) GAG }	GGU } GGC } Glycine (Gly) GGA } GGG }	U C A G