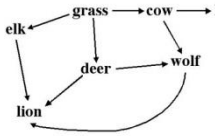
TEK 12A-Nature Relationships (5.RS)

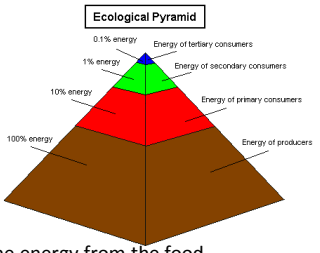
Relationships in Nature

- Mutualism-Both species benefit
- Commensalism-one helped , one unaffected
- Parasitism- one helped, one harmed
- Predation- one hunts other
- Competition- fight for resource

TEK 12C- Energy Flow(5.RS)



- More producers than consumers Affecting one species will causes changes to the whole food web



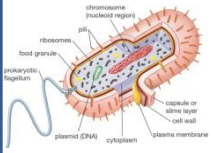
- Producer-Autotroph
- Primary Consumer-Eats producer
- Secondary consumer-Eats Primary
- You only get 10% of the energy from the food you eat the rest is lost as heat

TEK 9A- Biomolecules (1.RS)

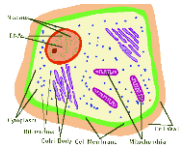
Bio-molecul	Elements	Function	Example	Monomer
Protein	C,H,O,N	Structural	Meat, Fish	Amino Acids
Carbohydrate	C,H,O	Short Term Energy	Fruit, Vegetable	Monosaccharide
Lipids	C,H,O	Long term Energy	Fats, Oils	Glycerol, Fatty Acids
Nucleic Acids	C,H,O,N,P	Store Genetics	DNA, RNA	Nucleotides

TEK 4A Prokaryote vs Eukaryote Cells (1.SS)

- Prokaryote-no nucleus, DNA in cytoplasm
- Eukaryote- contains a nucleus, DNA found here
- Bacteria are prokaryotic cells
- Plants, animals, fungi, and protists are eukaryotic cells
- Eukaryotes are more complex and have membrane bound organelles



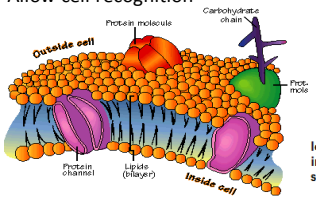
- Prokaryote



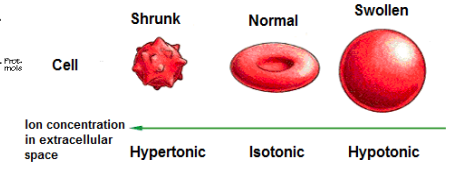
Eukaryote

TEK 4B- Cell Transport (1.RS)

- Homeostasis- balance condition
- Cell membrane functions
- Protective barrier
- Regulate transport of molecules
- Allow cell recognition

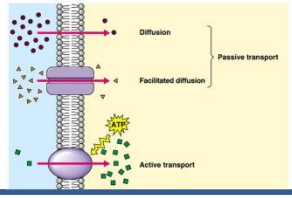


- Diffusion-molecules move using no energy
- Osmosis-water moves in or out of a cell due to concentration gradient
- Hypertonic-water leaves cell
- Hypotonic-water enters cell
- Isotonic-water is balanced



Types of transport

- Passive-Requires no energy
- Facilitated- no energy uses proteins
- Active Transport- uses energy
  - Moves against gradient
  - Exocytosis-Active trans out
  - Endocytosis-Active trans in

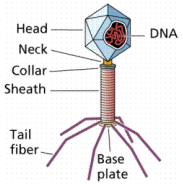


TEK 4C- Viruses (1.RS)

- Viruses are non-living since they have no nucleus and have to reproduce using living cells
- Viruses use the lytic and lysogenic cycles to reproduce

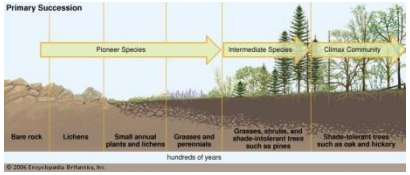
Viral structure

- Capsid-around outside
- Genetic material-DNA or RNA
- Examples of viruses:
- Cold HIV Flu

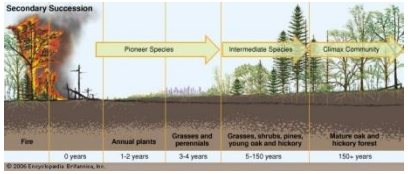


TEK 11D-Succession(5.RS)

- **Primary succession**- starts from nothing, volcano creating an island
  - Starts with lichen and other pioneer species before moss and plants
  - Simple plants die adding nutrients to soil
  - Animals start to inhabit area as well



- **Secondary succession**- something was there before: forest fire, natural disaster
  - Occurs faster since nutrients are in soil from before the disaaster



TEK 11C-Role of Microorganisms (5.SS)

Microorganisms Such as bacteria and protists can both help and harm individuals and the environment.

Example

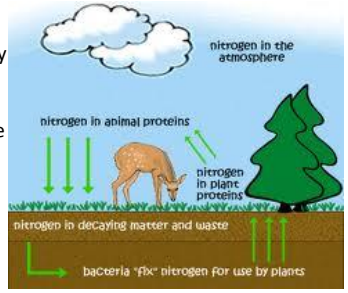
E.Coli can help with digestion in the body and cause disease when outside the body

Benefits of Bacteria	Harmful Roles of Bacteria
Decompose organic material	Spoil food
Change nitrogen in nitrogen cycle	Produce harmful toxins
Make drugs(penicillin),foods, and vitamins	Cause disease
Help with digestion of food	Consume too much oxygen (algae blooms)

TEK 12E-Cycles in Nature (5.SS)

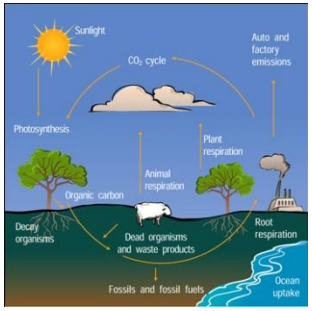
Nitrogen Cycle

- Nitrogen is removed from air by nitrogen fixation by bacteria or lightning
- Plants take in nitrogen from the soil
- Animals intake nitrogen from plants and store it in proteins
- Denitrifying bacteria return the nitrogen to the air



Carbon Cycle

- Carbon dioxide in the atmosphere is taken in by plants for use during photo synthesis
- Animals eat the carbon stored in glucose in the plant
- Carbon dioxide is released into the atmosphere during cellular respiration
- Carbon dioxide is also released from burning fossil fuels
- Dead organic waste also returns carbon to the environment



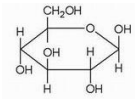
Disruptions of the cycles

- Disruptions like production of greenhouse gases can disrupt the normal flow of matter through the cycles

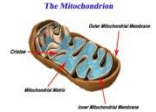
TEK 10C- Organization (4.SS)

- Atom-Lithium atom

- Molecule- Glucose

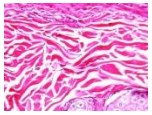


- Organelle- mitochondria

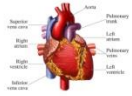


- Cell –animal cell

- Tissue- muscle tissue



- Organ-heart



- Organ System-Skeletal

- Population- mice

- Community- lion and deer

- Ecosystem-rainforest

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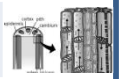
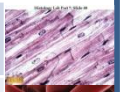
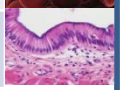
TEK 5B- Specialized Cells (1.SS)

Plant Part	Examples of Specialized cells
Leaf	Cells containing chloroplasts for photosynthesis Guard Cells control the size of stomates allowing gas transport
Stem	Xylem cells move water and minerals up Phloem cells move glucose down
Root	Epidermis cells on root hairs allow for absorption of water and minerals



Animal Cell	Examples of Specialized cells
Muscle Cell	Cause muscle contraction Skeletal-attach to bones, Cardiac-pump heart, Smooth-involuntary(digestion)
Blood Cell	Red blood cells-carry oxygen and nutrients White blood cells- fight infections Platlets cause blood clots
Epitheliu m Cell	Covers external surface of body, lines intestines and esophagus, has many different functions

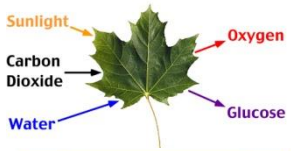




TEK 9B- Cell Energy (4.SS)

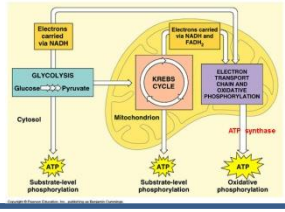
Photosynthesis

- Making of glucose(sugar)
- $6CO_2+6H_2O \rightarrow C_6H_{12}O_6+6O_2$
  Reactants Products
- Happens in chloroplasts
- Autotrophs only



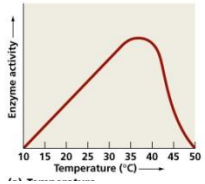
Cell Respiration

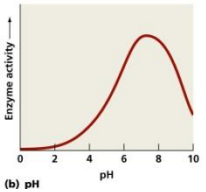
- Breaking down Glucose making ATP
- $C_6H_{12}O_6+6O_2 \rightarrow 6CO_2+6H_2O$
  Reactants Products
- Occurs in the mitochondria
- All living organisms



TEK 9C- Enzymes (4.SS)

- Proteins that speed up(catalyze) chemical reactions
- Specific to a certain substrate
- Are reusable
- End in the letters –ase
- Examples: sucrase, lactase,maltase
- Factors that affect enzymes
  - Environmental conditions
    - Extreme temperature
    - pH (acid or base)
  - Cofactors and Coenzymes
    - Minerals and vitamins
  - Enzyme inhibitors
    - Compete with enzyme





TEK 10A- Animal Systems Interactions (4.RS)

- An animals systems interact to perform many functions

Regulation	The endocrine system makes certain hormones. Blood carries the hormones to areas that help balance nutrients the body like glucose.
Nutrient Absorption	Food is broken down in the stomach by muscles, water, acid and enzymes. Nutrients are then absorbed into the blood.
Reproduction	Certain hormones produced in the endocrine system control ovulation in a female's reproductive system.
Defense	Mucus in the lungs trap a virus in the respiratory system, T-cells in the immune system destroy viruses, nerves in the skin protect from dangerous situations

TEK 10B- Plant Systems Interactions (4.RS)

- A plant's systems interact to perform many functions

Function	Example of interaction
Transport	The root system uptakes water Xylem vessels transport water to the leaves in the shoot system Phloem vessels transport sugars and nutrients throughout the plant
Reproduction	The reproductive organs of the flower are the pistil(female) and the stamen(male) A seed is a mature, pollinated ovule(fertilized egg) Hormones in a plant's root system help trigger the growth of a seed in the shoot system
Response	When one side of a plant does not receive enough light, a hormone that causes growth is produced in the shoot system's leaves. It is transported to the darker side. As the dark side grows, the plant bends toward the light.

TEK 11A- Homeostasis and Internal Feedback (4.SS)

- Homeostasis is the process by which cells and organisms maintain a constant balance
- Internal feedback is a self-regulating process that can help maintain homeostasis

Mechanism	Response to stimulus	Example
Negative feedback	Decreases effect	A human that gets too hot will cool himself by dilating blood vessels and sweating
Positive Feedback	Increases effect	Ethylene is produced when apples ripen which causes the release of more ethylene causes more ripe apples

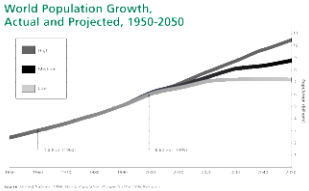
TEK 12F-Evironmental Change Impacting Ecosystems (5.RS)

- Change in the environment, caused by nature or humans, can affect the stability of and ecosystem in a positive or negative way. Changes can help sustain or destroy populations of species.

Example A
A volcanic eruption kills a community's populations of organisms. The area's ecosystem is destroyed.
Example B
Leaking sewage systems release sewage into a river, causing excessive weed and algae growth and reducing fish population. Humans repair leaks and reintroduce fish species. As a result, the ecosystem recovers.

TEK 12D- Survival of Species (5.SS)

- The long term survival of organisms depends on the resources supplied by their environment
- Needed Resources-food, water, air, space
- Populations size is limited by availability of resources
- Factors that can affect population size
  - Competition
  - Predation
  - Parasitism and disease
  - Drought and other climate extremes
  - Human disturbances



TEK 11B- Population Responses (5.SS)

Organisms must respond to external factors like changes in the environment or other organisms. If it cannot change they will become extinct

Example: A fire destroys all of the grass in a food chain

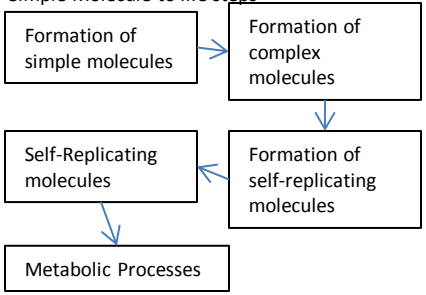
1. Many mice switch to berries and seeds as alternative food sources population survives
2. The rabbits are unable to find new food sources. They leave to look for grass in a new community. If they are unsuccessful then the population will die out

TEK 9D- Simple Organic Molecules(1.SS)

Organic Molecules- molecules that contain certain bonds between carbon atoms

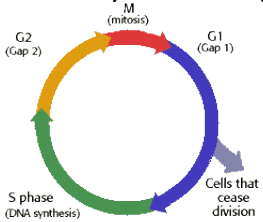
All living things are made from organic molecules

Simple Molecule to life steps

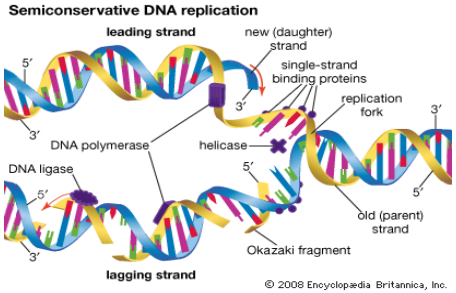


Reporting Cat 1 Cells	Reporting Cat 2 Genetics	Reporting Cat 3 Evolution and Taxonomy	Reporting Cat 4 Biological Systems	Reporting Cat 5 Environmental Systems
11 Questions	11 Questions	10 Questions	11 Questions	11 Questions
4 Readiness	3 Readiness	3 Readiness	2 Readiness	4 Readiness
5 Supporting	8 Supporting	7 Supporting	4 Supporting	5 Supporting

TEK 5A- Cell Cycle and Mitosis (1.RS)



G1 Phase	S Phase	G2 Phase	M Phase	Cytokinesis
First Growth Stage	Copying of DNA	Time bewteen DNA synthesis and mitosis	Cell growth stopped	Occurs after chromosomes separate
Cell Increases size	Chromosomes Duplicated	Cell Continues Growing	Cell's energy used to make 2 daughter cells	Forms two, identical daughter cells
Cell Prepares to copy DNA		Needed proteins produced	Called Mitosis	



DNA Replication

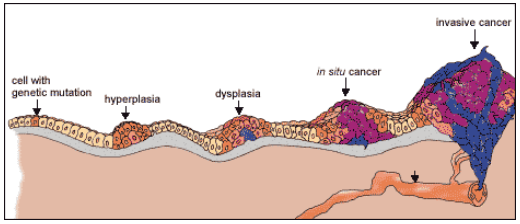
- DNA Must be copied before cell division occurs
- Copied during S Phase of Cell Cycle
- Process is semi -conservative (half new, half old)
- Helicase enzyme unwinds and separates the DNA
- DNA polymerase adds free nucleotides the single DNA strands
- Adenine matches with Thymine, Cytosine matches with Guanine
  - Apple-Tree, Chewing-Gum
- Two identical strands of DNA are created for use in mitosis
- Example: ATTCGATCGAT
  TAAGCTAGCTA

TEK 5C- Cell Differentiation (1.SS)

- All cells in the body have all of the DNA except gamete cells
- Each cell only transcribed and translates the genes it needs
- Gene expression- genes that are transcribed and translated by a cell
- Factors affecting Expression
  - Internal Factors
    - Proteins or hormones within the organism
  - External Factors
    - Temperature changes, supply of oxygen, and available nutrients
    - Pollution and climate factors

TEK 5D- Disruptions of Cell Cycle and Cancer(1.SS)

- Disruption or loss of control of the cell cycle can lead to cancer
- Cancer is the uncontrolled growth and reproduction of cells
- Uncontrolled growth of cells is a tumor
- Benign tumors are harmless, malignant or cancerous tumors can be deadly
- Can occur in almost any organ

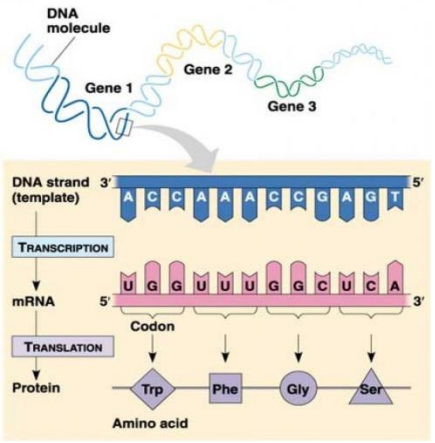


STAAR Biology Semester 2 Review

Created By

Nick Dellas LBJ Early College High School

TEK 6C- Transcription and Translation(2.SS)

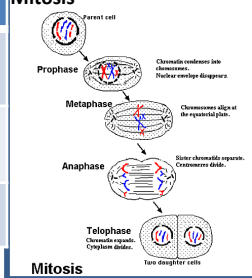


Transcription

- Process of making mRNA from DNA
- Occurs in the nucleus
- RNA polymerase enzyme helps to create the mRNA
- Adenine- Uracil, Cytosine-Guanine
- Example: DNA- ATC GAT AGC
  mRNA- UAG CUA UCG

Types of RNA

- mRNA- messenger blueprint, made in nucleus, sets of three nitrogen bases called codons
- tRNA- transfer RNA, carries amino acids to the ribosomes, sets of 3 nitrogen bases called anticodons
- rRNA- ribosomal, makes up ribosomes

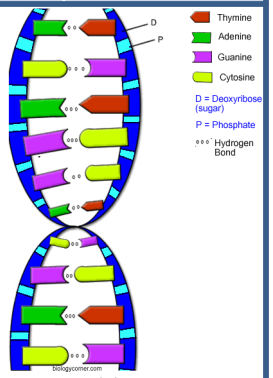


Prophase	DNA coils Nuclear membrane disappears
Metaphase	Chromosomes line up in the middle of the cell
Anaphase	Chromosomes are seperated toward ends of cell
Telophase	Separation of chromosomes complete Nuclei reform in new cells

TEK 6A- DNA Components (2.RS)

DNA-Deoxyribonucleic Acid

- Double Helix- twisted ladder
- Made of nucleotides
- Nucleotide
  - Phosphate group
  - Deoxyribose sugar
  - Nitrogen base
    - Adenine(A)
    - Thymine(T)
    - Cytosine(C)
    - Guanine(G)
- Packaged in chromosomes
- Blueprint for your traits
- Found in nucleus of the cell



DNA Model

TEK 6E- Genetic Mutations(2.RS)

- Occurs during DNA replication
- Gene mutation changes a single gene
- Only mutations in gametes DNA can be inherited

Type	Mutation	What happens	Example
Point Mutation	Substitution	One base pair is replaced	CUU changes to CUA
Frameshift Mutation	Insertion	Base pair is added	TACGCA→TAC**A**GCA
	Deletion	Base pair is removed	TACGCA→TAGCA

Translation

- Process of building a protein by matching codons in mRNA to anticodons of tRNA(use the codon chart), occurs in the cells ribosome
- Example: DNA- TAC GAT AGC
  mRNA- AUG CUA UCG
  tRNA- UAC GAU AGC
  AA- MET LEU SER
- Amino Acid chain is called a protein or polypeptide
- Protein will continue to be created until the mRNA reaches a stop codon
- There are 20 amino acids

First Letter	Second Letter U	Second Letter C	Second Letter A	Second Letter G	Third Letter
U	phenylalanine	serine	tyrosine	cysteine	U
	phenylalanine	serine	tyrosine	cysteine	C
	leucine	serine	stop	stop	A
	leucine	serine	stop	tryptophan	G
C	leucine	proline	histidine	arginine	U
	leucine	proline	histidine	arginine	C
	leucine	proline	glutamine	arginine	A
	leucine	proline	glutamine	arginine	G
A	isoleucine	threonine	asparagine	serine	U
	isoleucine	threonine	asparagine	serine	C
	isoleucine	threonine	lysine	arginine	A
	(start) methionine	threonine	lysine	arginine	G
G	valine	alanine	aspartate	glycine	U
	valine	alanine	aspartate	glycine	C
	valine	alanine	glutamate	glycine	A
	valine	alanine	glutamate	glycine	G

TEK 8A-Classification (3.SS)

Levels of Classification of Humans

Kingdom (King) Largest Animalia
- Multicellular mobile heterotrophic eukartoyes

Phylum (Phillip) Chordata
- Nerve chord pharyngeal slits

Class (came) Mammalia
- Hair, mammary glands, four-chambered heart

Order (over) Primates
Nails, clavicle, opposable digits

Family (for) Homidae
- Bipedal, advanced tool use

Genus (good) Homo
- "Human" like

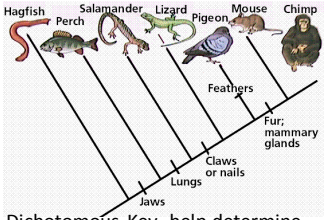
Species (soup) (Smallest) Homo sapiens

Binomial nomenclature-
- Scientific naming
- Genus and species
- Italics
- Capitalize the genus

TEK 8B- Classification(3.RS)

Cladograms- a diagram that shows relationships among groups of organisms

•In a cladogram more closely related groups appear closer together while more distantly related groups a farther away



Dichotomous Key- help determine species

•Follow the clues in a dichotomous key to identify an organism by their characteristics

•Always start at step one

1. a. Animal b. Plant	Go to step 2 Go to step 3
2. a. Lives on land b. Lives in water	Go to step 4 Go to step 5
3. a. Brown and green b. Green	Aqua Wheat Poison Grass
4. a. Four arms b. Three or less	Terrestrial Humanoids Go to step 6
5. a. Has fins b. Doesn't have fins	Go to step 7 Go to step 8
6. a. Feeds off humanoids or plants b. Makes their own food	Go to step 9 Go to step 10
7. a. Fins have one color b. Fins have two colors	Go to step 11 Aquatic Humanoids
8. a. Has 8 legs b. Has 8 tentacles	Giant Aqua Spider Tentacled-Aqua Humanoids
9. a. Humanoid eaters b. Non-Humanoid eaters	Go to step 12 Go to step 13
10. a. Photosynthetic b. Uses sunlight to make food	Green-Haired Rats Fuzzy Hamsters
11. a. Has orange fins b. Has green fins	Chemosynthetic Goldfish Photosynthetic Sun-Basking Shark
12. a. Eat off any Humanoid b. Drink blood	Parasitic Mosquitoes Ten-Legged Flea
13. a. Eat Humanoid waste b. Eat Poison Grass	Cockroaches Butter-Roaches

TEK 12B Adaptations- (5.SS)

Genetic Variety-different phenotypes

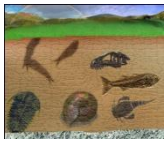
Adaptations due to environment

Example: organisms in grasslands have flat teeth for grinding their food

TEK 7A- Evidence of Evolution (3.RS)

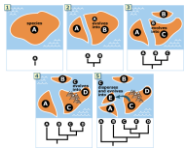
Fossil Record

•A variety of organisms have existed over time starting very simple and evolving to more complex



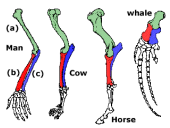
Biogeography

•Species that live in the same area are more closely related, but species related species can be found living far apart



Anatomical Homologies

•Similar structure , different function(human arm, whale flipper)



Molecular Homologies

•Similar DNA sequences may show relatedness

Developmental Homologies

•Embryonic similarities

TEK 7E-Natural Selection and Diversity (3.RS)

Evolution is the change of a population over time

Natural Selection is a theory that explains how evolution occurs

•Individuals in a population that are better adapted to their environment are more likely to survive

•Inherited variations are differences in traits of individuals of the same species

•Adaptation is a trait that increases an organism's chance of survival in its environment

•The more favorable trait will survive and be passed down

TEK 6B-Genetic Code (2.SS)

All living organisms have genetic material (DNA and RNA)made of nucleotides

• Nucleotide- Phosphate group, Deoxyribose sugar, Nitrogen base [Adenine(A), Thymine(T), Cytosine(C), Guanine(G)]

•The code is universal among all living organisms

TEK 7B- Fossil Record (3.SS)

Fossil record is a timeline that shows how life evolved

•Gradualism- species changes very slowly over period of time

•Punctuated Equilibrium-little or no change over long period followed by sudden change

•Living fossil-species that has changed little since first appearing of Earth

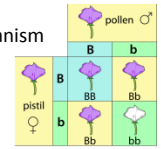
TEK 8C- Kingdoms (3.SS)

Kingdom	Cell Type	# of Cells	Nutrition	Reproduction	Examples
Archae	Prokaryote	Unicellular	Auto/Hetero	Asexual	Halophiles, Methanogens
Eubacteria	Prokaryote	Unicellular	Auto/Hetero	Asexual	E.Coli, Streptococcus
Protista	Eukaryote	Uni/Multicellular	Auto/Hetero	Asexual/Sexual	Amoeba, paramecium, giant kelp
Fungi	Eukaryote	Uni/Multicellular	Hetero	Asexual/Sexual	Mushrooms, yeast, mold
Animalia	Eukaryote	Multicellular	Hetero	Sexual	Sponges, Humans, worms, insects
Plants	Eukaryote	Multicellular	Auto	Asexual/Sexual	Mosses, Flowers, ferns, trees

TEK 6F- Genetics(2.RS)

Phenotype-What the organism looks like (purple, white)

Genotype-gene combination(BB, Bb, bb)



Incomplete Dominance

•RR=Red, Rr=Pink, rr=White

•Third Genotype is a blend

Co-dominance

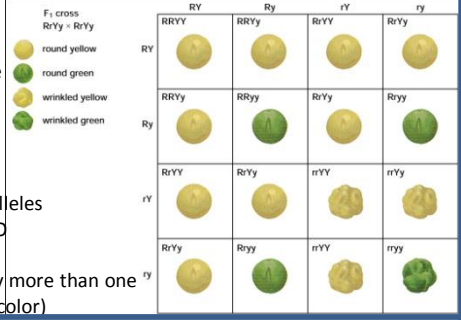
•BB=Black, BW= Spotted, WW=White

•Third genotype shows both

Dihybrid Cross

•Cross of 2 traits

•Gametes will be combinations of 2 alleles



Multiple Alleles

•Genes have more alleles

•Blood type-A,B,AB,O

Polygenic Traits

•Trait determined by more than one Gene (hair and skin color)

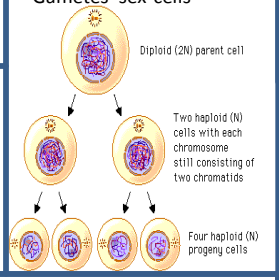
TEK 6G- Meiosis(2.SS)

Meiosis- creation of gametes using cell division

•Involves Meiosis I and Meiosis II

•Creates 4 haploid cells from one diploid cell

•Gametes=sex cells



TEK 7F- Evolutionary Mechanisms(3.SS)

Genetic Drift-Change in gene pool caused by chance(flood kills 95% of worm pop.)

Gene Flow-Change in in gene pool caused by organisms moving around

Mutation- Change in gene pool caused by genetic mutations in gamete cells

Recombination- Variation due to crossing over of gene during meiosis

TEK 7G- Cell Complexity (3.SS)

3.5 billion year ago- ancient prokaryotic ancestors

2.2 billion years ago- first photosynthetic bacteria

2.1 billion years ago- first eukaryote fossils

Endosymbiosis- one organism lives inside another and both benefit

TEK 7D- Inherited Variation (3.SS)

Inherited Variation	Inherited traits that are favored (Ex. Black mice have better camouflage)
Producing More offspring than needed	Producing more offspring give better chance of species survival
Limited Supply of Resources	When competition arises those with best traits survive

TEK 6H-DNA Testing (2.SS)

DNA Fingerprinting- compares sections from 2 or more samples

•DNA Extraction- opening cells to isolate DNA ("spooling")

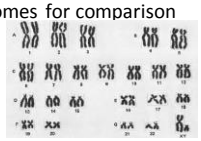
•DNA Cutting- large molecules are cut using restriction enzymes

•Electrophoresis- DNA is separated based on size and charge

Karyotyping- visual display of chromosomes for comparison

•Allows for observation of missing or extra chromosomes like Down's Syndrome and Trisonomy

•Pictures taken during metaphase



TEK 6D-Gene Expression Regulation (2.SS)

All cells except gamete cells in the human body have a complete copy of DNA

Prokaryotes Regulation

•Promoter begins transcription

•Operator controls rate of transcription

•Repressor prevents the transcription from occuring

Eukaryote Regulation

•Controlled by transcription factors

•Each type of factor affects gene expression in different ways

•Specific factors must be present for transcription to occur

TEK 7C- Natural Selection and Population Change(3.SS)

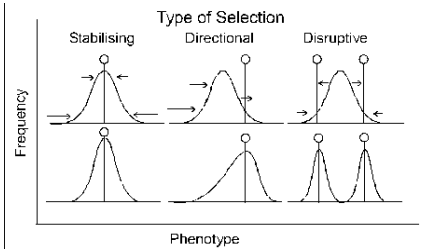
Variations cause advantages

Stabilizing Selection

•Extreme phenotypes are a disadvantage

Directional Selection

•A particular phenotype has an advantage

Disruptive Selection

•When extreme phenotypes are an advantage