BIOLOGY SOL REVIEW: A QUICK OVERVIEW

Useful Web sites

1. Released SOL Tests, Interactive, Provides Score

http://www.solpass.org/hs.htm#biology

2. Flashcard Review

http://www.studystack.com/flashcard-38612

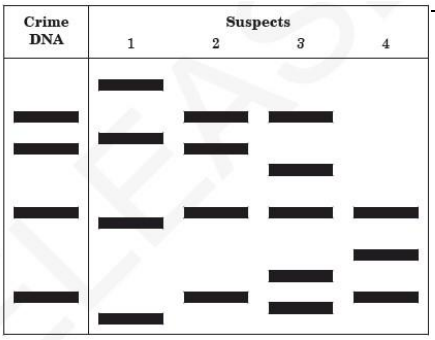
3. Really good interactive biology review questions

http://www.bedford.k12.va.us/srhs/sol/biology1.htm

4. Review with a few or many questions. Select # of questions& biology

http://education.jlab.org/solquiz/index.html

Who is guilty? Read the DNA Fingerprint



Ecology

Commensalism	1 benefits, 0 harmed	Orchid in a tree
Mutualism	2 benefit, 0 harm	Bacterial in human intestine
Parasitism	1 benefit, 1 harmed	Tapeworm
Producer	Autotroph	Plant, photosynthetic bacteria or protist
Consumer	Heterotroph	Must eat
Decomposer	Breaking down dead organisms	Fungi or bacteria growing on a dead tree
Scavenger/detritivore	Eats dead organisms	Buzzard eating a dead skunk
Herbivore	Eats plants	aphids
Carnivore	Eats meat	Dog
Omnivore	Eats plants & meat	Humans
Primary consumer	Always a herbivore	
Pioneer	1st photosynthetic organism to colonize barren area	Ex. Moss or lichens
Secondary consumer	Eats primary consumer	May also be an omnivore
Tertiary consumer	Eats secondary consumer	May be an omnivore
Primary succession	New life	Melting glacier, new island
Secondary succession	New life where there was life before	Mt. St. Helens, forest fire
Punctuated equilibrium (evolution)	No change followed by short periods of abrupt change	
Gradualism (evolution)	Slow change	

Odds & Ends:

Ingest: to consume
Splice: to join together
Optimum: best
Aquatic: water
Terrestrial: land

Predator: the hunter
Prey: the one being hunted

Species: organisms look alike, breed, produce fertile offspring
Hybrid: offspring of 2 different species, usually not fertile
Population: same species living in same place
Community: made up of many populations
Ecosystem: how communities interact with environment
Biosphere: made up of ecosystems

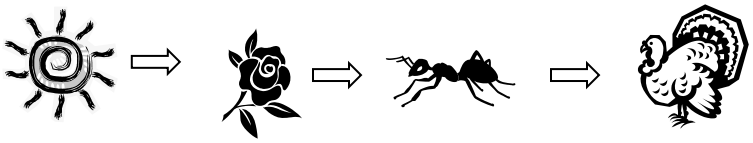
Homeostasis: maintaining a constant internal environment such as pH, body temperature, water content

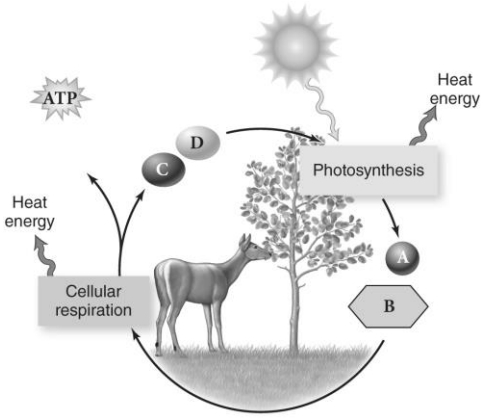
Metabolism: all the chemical reactions that take place in the body

Enzymes: function as catalyst to speed up chemical reactions, can be reused, can be affected by temperature & pH

Carrying capacity: maximum number of organisms that an environment can support: S curve, logistic growth, larger organisms

Exponential growth: J curve, smaller organisms, rapid growth followed by sudden massive death , do not care for young





Food Chain: Producer → primary consumer→ secondary consumer
(herbivore) (carnivore or omnivore)

Producers (makes food) = Autotroph: photosynthesis **&** cellular respiration
Consumer (eats) = Heterotroph: cellular respiration
Arrows show flow of energy

Photosynthesis: uses light + CO_2 +H_2O → makes O_2 + $C_6H_{12}O_6$ (sugar)

Cellular Respiration: uses O_2 + $C_6H_{12}O_6$ → makes CO_2 + H_2O + 36ATP + HEAT **(purpose is to make ATP)**

Photosynthesis & Cellular Respiration form a cycle because the product of one is the start up material for the other.

A = oxygen
B = glucose ($C_6H_{12}O_6$)
C = water
D= CO_2

CHEMISTRY: Organic Molecules have a Carbon. 4 MACROMOLECULES (all can be used as fuel for body):

Molecule name	Made of	Used for	examples
Carbohydrate	C, H, O	Energy storage	Usually end in "ose" Plants store glucose as starch (ie. Potatoes)
Lipids	C, H, O Shaped like an "E"	Cell membranes, estrogen, long term energy storage	Fat, oil
Proteins	C, H, O, N (forms amino acids…building blocks of life)	Skin, muscles, organs, enzymes	Usually end in "ase", Lactase
Nucleic Acids	C, H, O, N, P (forms nucleotides)	Stores genetic info	DNA & RNA

Examples of Polysaccharides (carbs):
Cellulose: found in plant cell walls
Starch: polymer made up of monomers, how plants store sugars
Glycogen: digested starch, found in liver and muscles

Structure	Prokaryote	Eukaryote			
		Plant	Protist	Animal	Fungi
Cell Wall	Yes	Yes	Mostly No	No	yes
Cell membrane	Yes	Yes	Yes	Yes	yes
Organelles	No	Yes	Yes	Yes	yes
Ribosomes	Yes	Yes	Yes	Yes	yes
chloroplast	no	yes	Some	no	no
Nucleus	No	Yes	Yes	Yes	yes
Centrioles	No	No	Yes	Yes	no
Example	ONLY bacteria	Cactus	Paramecium	Human, worms	Mushroom , yeast

Cell History: In order of Discovery

Invention of microscope
Hooke: viewed cells & named them "CELLS"
Van Leeuwenhoek: viewed pond water & saw "animalcules", now called Protist, also made microscopes
Schleiden: plants are made of cells
Schwann: animals are made of cells
Virchow: cells come from cells
Cell Theory: developed the cell theory which states that all living things are made of 1 or more cells, cells come from cells, cells are the basic unit of life

Modern Cell Theory: Energy flow occurs within cells (ATP), Heredity information (DNA) is passed on from cell to cell, All cells have the same basic chemical composition (CHONPS or macromolecules)

Darwin: Theory of Evolution

Speciation: the formation of a new species, must become reproductively isolated

Geographic Isolation: when species become separated by barriers such as mountains or water, may lead to a new species
Example: finches on Galapagos Islands
Temporal Isolation: species are separated by mating at different times of the year

Behavioral Isolation: species are separated by different mating rituals

Natural Selection: "survival of the fittest"

Artificial Selection: "humans select the trait, nature provides variation"

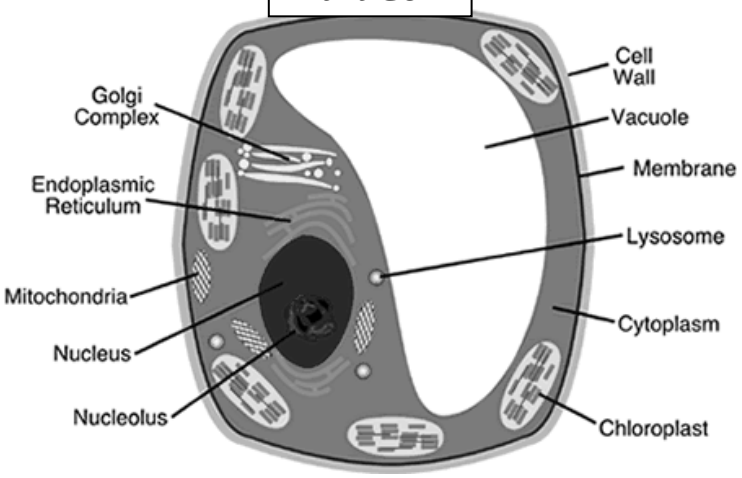
Homologous: same or similar structures bone structures in vertebrate forelimbs: bones in bats, humans, alligator are similar

Analogous: structures do not look similar but serve similar function: Bird wings & butterfly wings

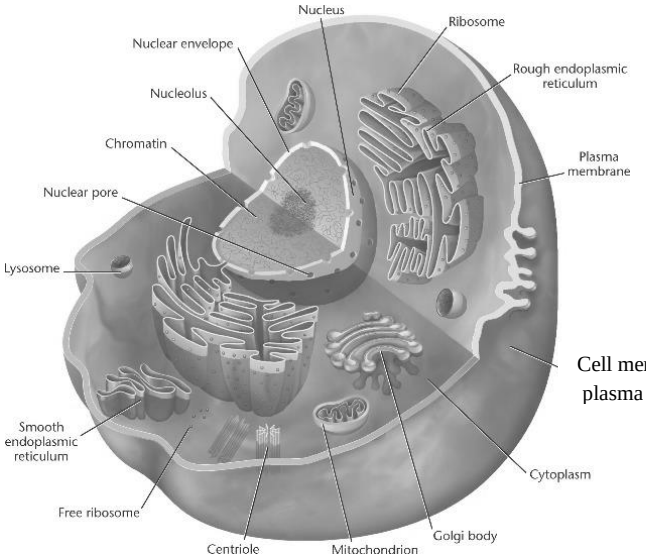
Vestigial: structures of little or no use: Wisdom teeth, human tail bone (coccyx)
Vertebrate Embryology: large head, pharyngeal pouches, tail

Golgi: Packaging center
Mitochondria: power house, where ATP (cellular energy) is made
Nucleus: control center, "brain" of cell
Ribosomes: where is protein is assembled
Lysosome: digestion
Nucleolus: where ribosomes are formed
Rough ER & Smooth ER : transportation
Vacuole: storage of food & waste
Centriole: used in animal cell reproduction only
Cell membrane: regulates what enters & exits the cell
Nuclear membrane: regulates what enters & exits the nucleus

Plant Cell

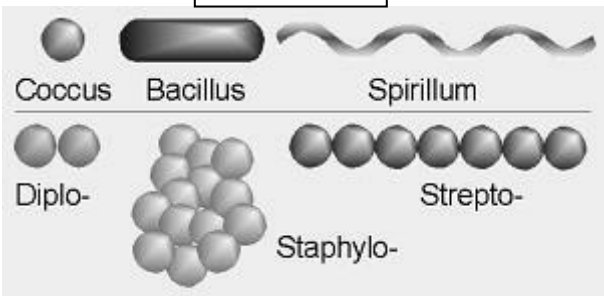


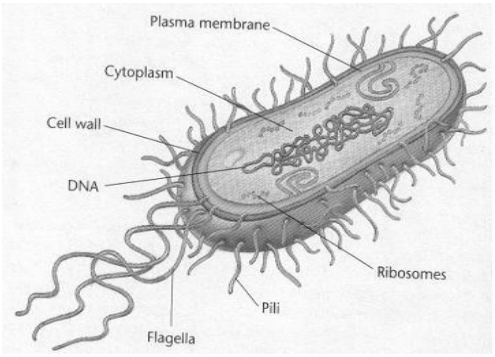
Animal Cell



Cell membrane or plasma membrane

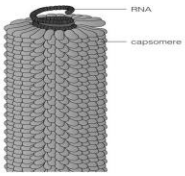
Bacteria



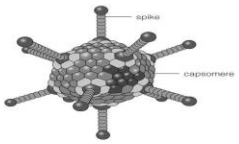


Viruses: NON-living: have DNA or RNA, capsid, have surface proteins, membrane
Can't reproduce outside of a cell, forms crystals

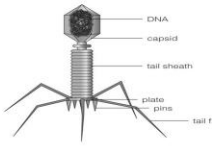
Viral Shapes:



helical



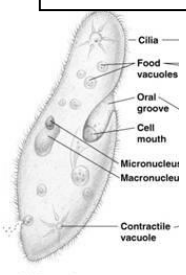
polyhedral

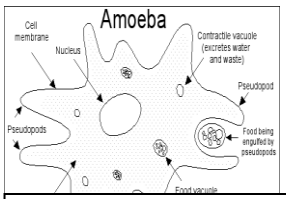


bacteriophage

Protista (mostly unicellular, all have contractile vacuoles to regulate water)

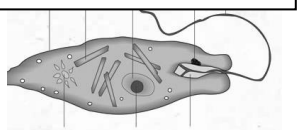
Paramecia (macro & micro nuclei)





Has pseudopods (false feet)

Euglena (has red eyespot & chloroplast, both auto & heterotrophy)



KINGDOM: Animalia
Multicellular organisms; cells with a nucleus, with cell membranes but lacking cell walls

PHYLUM: Chordata
Animals with a spinal chord

CLASS: Mammalia
Warm-blooded chordates that bear live young; females have mammary glands that secrete milk to nourish young

ORDER: Primates
Mammals with collar bone; eyes face forward; grasping hands with fingers; two types of teeth (incisors and molars)

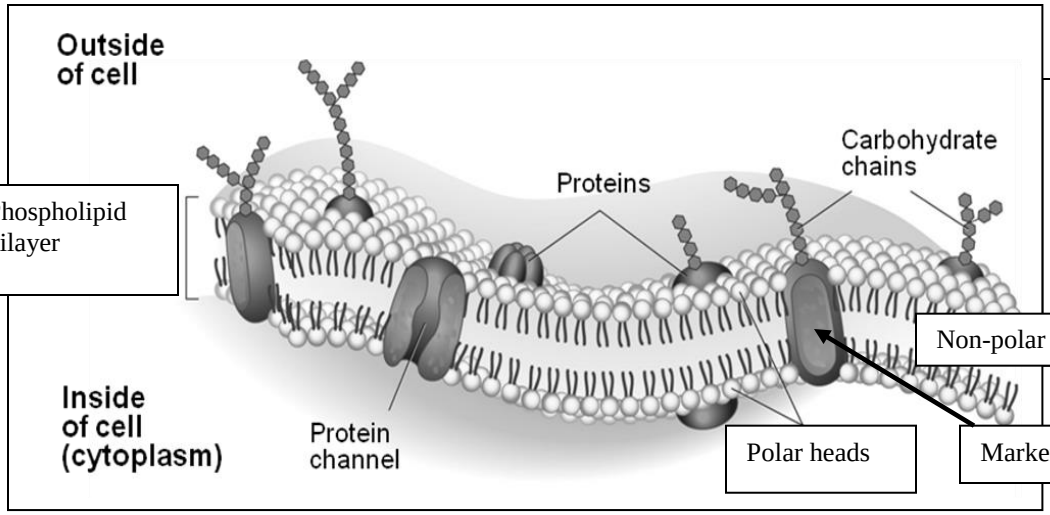
FAMILY: Hominidae
Primates with upright posture, large brain, stereoscopic vision, flat face, different use of hands and feet

GENUS: *Homo*
Hominids with S-curved spine, recognisable as human

SPECIES: *Homo sapiens*
Humans with high forehead, well-developed chin, thin skull bones

Channel protein (passageway for food)
Receptor protein (receives chemical info)
Marker protein with carbohydrate flag (identifies the cell)
Polar heads (hydrophilic)
Nonpolar tails (hydrophobic, don't like water, forms true barrier

Structure of a Cell Membrane: Fluid Mosaic Model

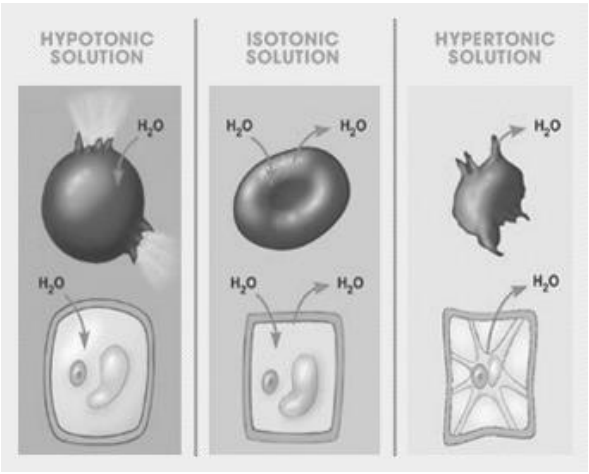


Osmosis: diffusion of water from high to low concentration

Diffusion: movement of solute from high to low concentration

Important People:

Francesco Redi	Proved life comes from life (used meat & maggots)
Spallanzani	Believed in spontaneous generation
Pasteur	Pasteurization, rabies vaccine, germ theory, life from life
Joseph Priestly	Plants make Oxygen (used plant, candle, mouse)
Melvin Calvin	Carbon Dioxide is used to make glucose
Hans Kreb	Citric Acid Cycle or Kreb cycle for cellular respiration
Fleming	Discovered penicillin
Koch's postulate	Developed method to prove germs cause disease

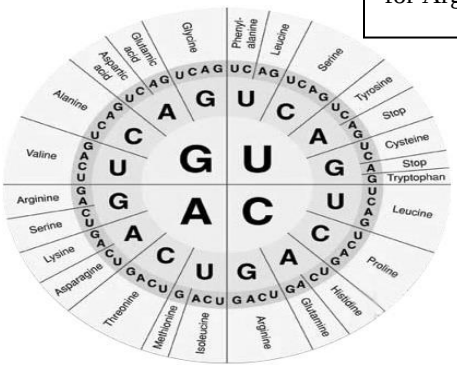


Experimental Design:

Dependent variable	What is measured & counted
Independent variable	What the scientist changes in experiment
Control	Group used for comparison, scientist doesn't change it
Constants	Conditions kept the same for control & experimental group

Universal Genetic Code

example CGU codes for Arg



	U	C	A	G	
U	Phe	Ser	Tyr	Cys	U
	Phe	Ser	Tyr	Cys	C
	Leu	Ser	STOP	STOP	A
	Leu	Ser	STOP	Trp	G
C	Leu	Pro	His	Arg	U
	Leu	Pro	His	Arg	C
	Leu	Pro	Gln	Arg	A
	Leu	Pro	Gln	Arg	G
A	Ile	Thr	Asn	Ser	U
	Ile	Thr	Asn	Ser	C
	Ile	Thr	Lys	Arg	A
	Met	Thr	Lys	Arg	G
G	Val	Ala	Asp	Gly	U
	Val	Ala	Asp	Gly	C
	Val	Ala	Glu	Gly	A
	Val	Ala	Glu	Gly	G

Heredity & Genetics People: In order of discovery

Mendel	Father of heredity, worked with pea plants
Griffith & Avery	Transformation, worked with mice
Hershey & Chase	Proved DNA is genetic material
Franklin	x-rayed DNA
Chargaff	Base pairing rule A-T & C-G
Watson & Crick	Proved DNA is a double helix (spiral shaped, twisted ladder)

Chromosomes are made of 40% DNA & 60% protein
Chromosomes exist in pairs called homologues, a full set of pairs in a cell is a diploid cell , diploid for human somatic (body) cells is 46 or 23 pairs; haploid is one set of chromosomes, in humans haploid is 23 and is found in egg & sperm.

(B=brown, b=blond)
Phenotype : 75% = brown hair, 25% = blond hair
Genotype: 25% BB, 50% Bb, 25% bb

Punnett Square:

	B	b
B	BB	Bb
b	Bb	bb

Homozygous: same alleles (copy of a gene) for a trait, example: BB or bb
Heterozygous: different alleles for a trait, example: Bb

Phenotype: physical appearance or expression of genes
Genotype: genetic makeup, genes that you actually have, may not always be expressed

Incomplete dominance: allele not completely dominant, example: red flower x white flower = pink
Codominance: both alleles expressed at same time, example: blood types A x B = AB

DNA is made of :	RNA is made of:
Double strand	Single strand
Phosphate	Phosphate
Deoxyribose (sugar)	Ribose (sugar)
A- T & C- G (nitrogen bases)	A-U & C-G

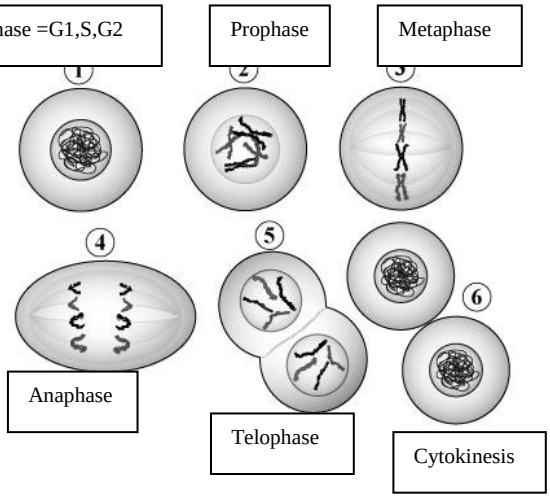
A = adenine, T = Thymine, C = cytosine, G = guanine, U = uracil

Replication	DNA to DNA happens in nucleus
Transcription	DNA to mRNA, happens in nucleus
Translation	mRNA to protein, happens on ribosomes (rRNA)
Building blocks of life	Amino acids (= protein)

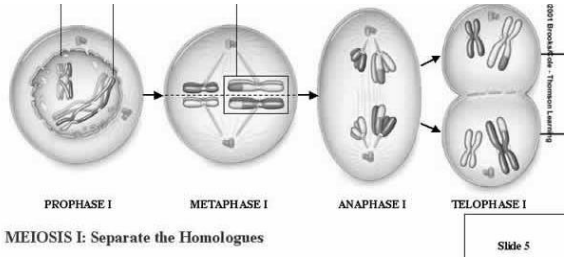
Mutation: changes in genetic material

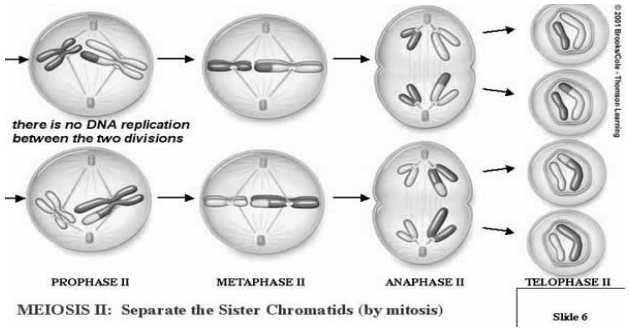
Genetic Engineering: recombinant DNA = DNA of 2 different organisms combined

Mitosis = PMAT



Cell Cycle: where cell grows and copies DNA: G1, S, G2 = interphase
Mitosis: asexual cell reproduction, creates 2 genetically identical cells, makes body cells, stages: prophase, metaphase, anaphase, cytokinesis
Meiosis: sexual cell reproduction, forms gametes (egg & sperm), haploid, cuts chromosome # in half, stages:
Meiosis I: prophase I, metaphase I, anaphase I , telophase I
Meiosis II: prophase II, metaphase II, anaphase II, telophase II





Comparison of Kingdoms

Kingdom	Prokaryote or Eukaryote	DNA ?	Nucleus?	Cell wall?	Cell membrane ?	Reproduce	Movement?	Cells?	Nutrition?
Animal	E	Yes	Yes	No	Yes	Most sexual (gametes) Some asexual (budding & regeneration)	Mostly Complex	Multicellular	Heterotroph/ consumer
Plant	E	Yes	Yes	Yes cellulose	Yes	Mostly Sexual, (forms spores or seeds)	Sessile (no movement)	Multicellular	Autotroph / Producer
Fungi	E	Yes	Yes	Yes, made of chitin	Yes	Sexual (spores) & Asexual (budding)	Sessile	Mostly Multicellular	Heterotroph/ Consumer (external digestion)
Protist	E	Yes	Yes	Usually, No	Yes	Sexual (conjugation) & Asexual (mitosis or fission)	Cilia, Flagella, Pseudopod	Mostly Unicellular	Some Auto, some Hetero, some both
Archaebacteria	P	Yes	No	Yes Pepti-doclycan	Yes	Binary Fission	Pili, Flagella	Unicellular	Hetero
Eubacteria	P	yes	No	Yes Peptido-glycan	Yes	Binary Fission	Pili, Flagella	Unicellular	Some Hetero, Some Auto, (some parasitic, some decomposers)

HUMAN Systems:

Endocrine: glands that release products into the bloodstream to take chemical messages to the cells. Glands include: pituitary, hypothalamus, ovaries, testis, pancreas, thyroid, adrenal, thymus, pineal, parathyroid

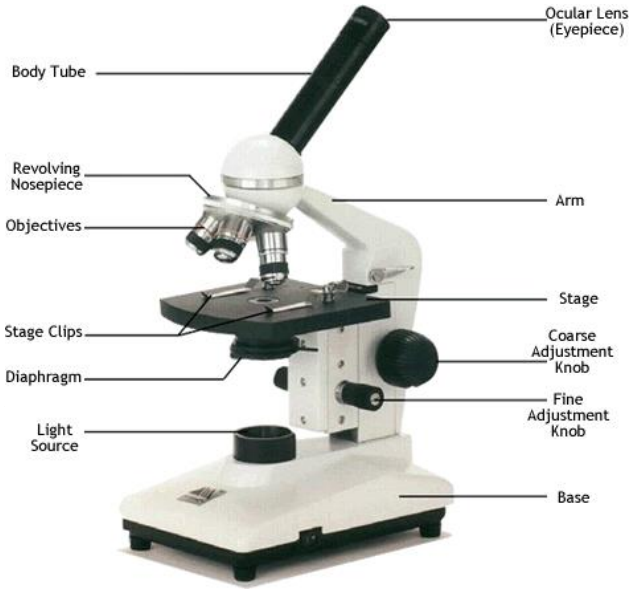
Digestion: mouth & salivary glands, esophagus (food pushed through using peristalsis…wavelike muscular contractions), stomach (store, digest protein using enzyme pepsin), small intestines digestion is completed & nutrients are absorbed into blood stream using villi (fingerlike projections that increase surface area), large intestine or colon (unabsorbed & digested material), rectum, anus

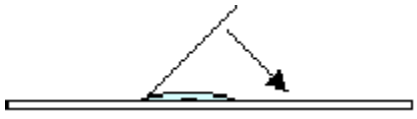
Excretory: kidneys (filter unwanted material), bladder (stores liquid waste), urethra (eliminates liquid waste), lungs remove carbon dioxide, water vapor

Circulatory: pulmonary veins (from lungs), left atrium (upper chamber), left ventricle(bottom chamber), aorta (largest artery), out to arteries, arterioles, capillaries, venules, veins, vena cava (largest vein), right atrium, right ventricle, pulmonary arteries (to lungs)

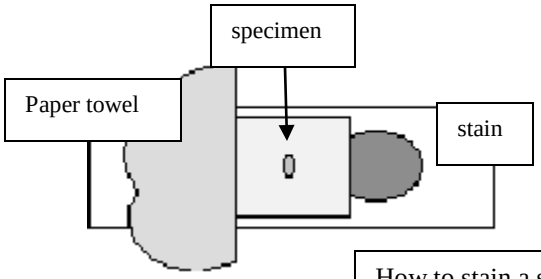
Respiratory: oral cavity or nasal cavity, pharynx (throat), larynx (voice box), trachea (windpipe), bronchus (filters), lungs (alveoli sacs to increase surface area), diaphragm (muscle that separates chest cavity from abdominal cavity, controls pressure in lungs)

Biome	Predominant plant	Predominant animal	Climate
Tundra	Short grasses, moss, lichens	Arctic fox, arctic hare, polar bear	Permafrost
Desert	Succulents (cacti)	Reptiles, birds…	Hot, dry
Tropical rainforest	Tall trees and vines	Colorful birds, frogs, monkeys	Rainy, hot
Savannah	Tall grasses, some trees	Elephants, zebra	Moderate rain, warm
Grassland	Grass	Prairie dogs, cattle	Moderate rain, temp. rich soil
Deciduous forest	Oak, maple (trees lose leaves)	Deer, squirrels	4 seasons, rich soil
Taiga, coniferous forest	Pines (conifers)(cones)	Bear, elk	colder





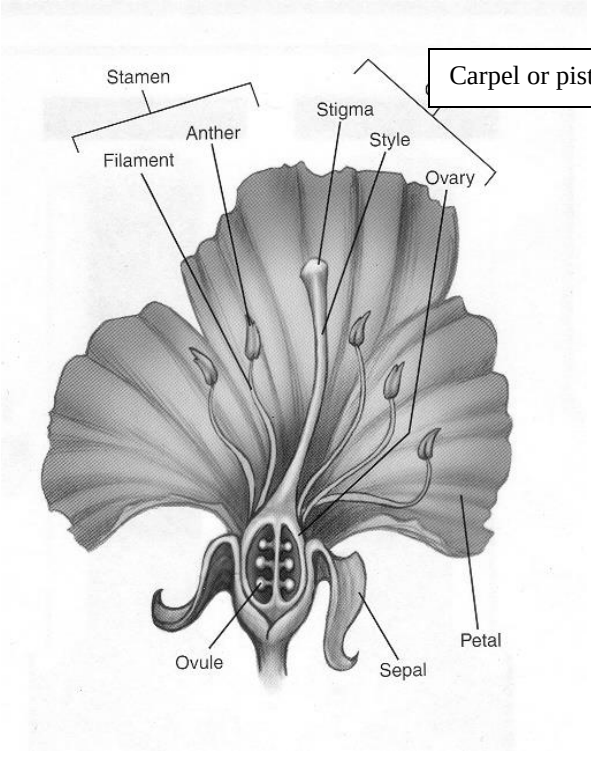
How to make a wet mount slide



How to stain a specimen on a slide

	Phylum	Class	Example	nutrition	symmetry	reproduction
INVERTEBRATES NO BACKBONE	Porifera		Sponges	Filter feeder	asymmetrical	Sexual, (hermaphrodites) Asexual (regeneration or budding)
	Cnidarians	Scyphozoan	Jellyfish,	heterotroph	radial	Sexual
		Hydrozoan	Hydra			Sexual, Asexual (budding)
		Anthozoan	Sea anemone, coral			sexual
	Platyhelminthes (flatworms)	Turbellaria	planaria	heterotroph	bilateral	Hermaphrodites
		Trematoda	Blood fluke(shistosomiasis)	parasitic		
		Cestoda	tapeworm	parasitic		
	Nematoda (roundworms)		Pin worms, hookworms, ascaris Filariasis (elephantiasis)	Heterotroph Parasitic	bilateral	sexual
	Mollusca	Gastropods	Snails, slugs,	Hetero	bilateral	sexual
		Bivalves	Oysters,clams	Hetero: Filter feeder		
		cephalopods	Octopus, quid	Hetero		
	Annelida (segmented)	Polychaeta	Marine worm	Hetero	bilateral	Sexual, hermaphrodites
		Oligochaeta	Earthworms	Hetero: Decomposer		
		Hirudinea	leeches	Hetero: Decomposer & scavenger		
	Arthropoda (jointed legs)	Sub Plylum: Chelicerata (fangs)	Spiders, mites, scorpions (arachnids)	hetero	bilateral	sexual
		Sub Phylum: Crustacea	Lobster, shrimp, (aquatic) pillbug (terrestrial)			
		Sub Phylum Uniramis (mandibles)	Insects (beetles, butterflys)			
	Echniderm		Sea urchin, sand dollar, star fish	Hetero, predator	Radial	Sexual, star fish can regenerate

Stamen = male structures
Anther contains pollen
Carpel or Pistil = female structures
Pollination occurs on stigma



Phylum	class	Example	Nutrition	# heart chambers	Respiration (Breathing)	Endothermic or ectothermic	Fertilization	Symmetry	reproduction
Chordata Subphylum Vertebrata (have a backbone)	Fish	Class Agnatha=jawless, lamprey & hagfish Class Osteichtheyes=boney, most fish ClassChondrichthyes=cartilage, sharks, rays, skates	Hetero	2	Gills	Ectothermic	Mostly external, some internal (shark)	Bilateral	sexual
	Amphibians	Frogs, toads, salamanders		3	Lungs & cutaneous (skin)	ectothermic	External		
	Reptiles	Snakes, turtles, alligators, lizards		3 ½ alligators & crocs have 4	Lungs with alveoli (increases surface area)	Ectothermic (cold blooded)	Internal		
	Birds	Eagle, cardinal Aves = birds		4	Lungs with air sacs, most efficient lungs	Endothermic (warm blooded)	Internal		
	Mammals	Kangaroo, opossum Hair & milk		4	Lungs with alveoli	Endothermic (warm blooded)	internal		Marsupial (pouch)
		Duck billed platypus Hair & milk							Egg layer
		Cat, bat, whale, human Hair & milk							placental

Oxygen & Carbon Cycles:
Pollutants, dead organisms, respiration of plants & animals put CO_2 into air
Only photosynthesis removes CO_2 & releases oxygen

Nitrogen Cycle: Legumes: plants with bacteria that convert N_2 into ammonia & nitrates useful for plants
Dead organisms release Nitrogen
Lightning converts atmospheric nitrogen

Phosphorous Cycle: found in water, soil, rock: does not involve air (gas)