

THE BASICS

1. List the steps of the scientific method. **1) Identify the problem/make an observation 2) Form hypothesis 3) Create an experiment to test hypothesis 4) Gather results 5) Form conclusions 6) communicate results**

2. Define the steps of the scientific method. **1) What are you trying to experiment or trying to find out in a form of a question. 2) A possible to your observatoins- a testable statement- and educated prediction 3) Step-by-step instructions that test your hypothesis including control and independent/dependent variables. 4)Gather all data found during the experiment and organize it 5) State if your hypothesis is correct/incorrect, redo experiment with no change to see if you get different results 6) Publish your results so that other scientists may redo experiment to come up with their own results**

3. Give an example of each step of the scientific method.

Problem- Which brand of popcorn leaves the least amount of kernals after popping?

Hypothesis- Scientist hypothesizes that Orville Redenbacher brand leaves the least kernals

Testing hypothesis/experiment- Scientist pops 3 brands of popcorn and counts the numbers of kernals (unpopped is the control).

Analyzing data- a scientist concludes that Orville Redenbacher has the least kernals

Evaluating results-scientists reads that another scientist also found the same information

4. Distinguish between an independent variable and a dependent variable.

independent variable- a in experiment that is manipulated/changed (scientist does it) (X axis on graphs)

dependent variable- changes found and measured that depends or results from what scientist manipulated or set up (Y axis on graph)

5. Define control group and experimental group.

control- group that us used to compare the data from experimental group experimental group is compared to the control group, tests the independent variable

6. What is the base units units of the metric system? **meters (length), liters (volume), grams (mass), Kelvin/Celsius (temperature)**

7. What is the metric system based on? **multiples of 10 (decimals)**

8. At what temperature does water boil and freeze in degrees Celsius and Farenheit? **Boil: 100°C 212 °F Freeze: 0°C 32°F**

9. List and define each property of life (How do you know something is alive?) **Cells- all organisms are made of 1 or more cells**

need for energy- energy important for metabolism

response to environment- must mantain homeostasis

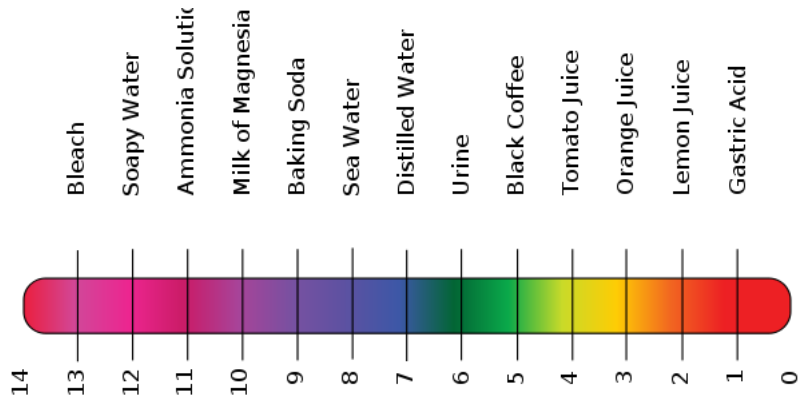
reproduction and development- must have ability to reproduce; all organisms have DNA; must mature

10. List the levels of organization in order and define each level.

cells (smallest unit of life) --> tissues (cells functioning together) --> organs (made of 2 or more tissues that work together heart, liver etc) --> organ systems (made of 3 or more organ systems respiratory, circulation etc)--> organism

BIOCHEMISTRY

1. Name each part of the atom and define each. **Nucleus- center of atom with most weight, electron cloud- where electrons are predicted to be**
2. Give the location and the charge for each subatomic particle.
proton- in nucleus, positive charge, neutron- in nucleus no charge, electron- outside nucleus in cloud, negative charge.
3. Name the 3 main types of bonds and define each type. **ionic bonds- bonds formed between charged particles (ions) positive/negative- give/take electrons; covalent bonds- forms bonds atoms share electrons; strongest bonds; hydrogen bonds- bonds between water molecule; weakest bonds**
4. Distinguish between solute and solvent. Give an example of each. **solvent- substance doing the dissolving (water), solute- substance being dissolved (salt).**
5. What is the most abundant compound in living organisms? **water (70-90% of cells**
6. Define macromolecule. **organic polymer molecule made of monomers- 4 main types.**
7. Carbohydrates: **Structure: carbon, hydrogen, oxygen 1:2:1 ratio**
function:energy storage for cells, part of cell structure
building blocks:monosaccharides (simple sugars) to form polysacchrides (C, H, O)
8. Proteins: **Structure: amino acids linked by peptide bonds to form polypeptides (hydrogen atom, amino group, carboxyl group)**
Function: structure, support, storage, transport, cellular signalling, movement, enzymes/catalysts
BB: monomer is amino acids, proteins are polymers (N, H, O, C)
9. Lipids: **Structure: glycerol & fatty acids (saturated-single bond, unsaturated- double bond)**
Function: Source of usable energy for cells (longer term storage), parts of cell membrane and cell structures
BB: monomers are triglycerides (Gyceral and fatty acid)
10. Nucleic Acids: **Structure: 5 carbon sugar, phosphate group and nitrogen base (A, T, G, C, U)**
Function: Make proteins, store and transmit genetic information
BB: Monomers are nucleotides; nucleic acids are ploymers
11. Define element, compound, ion and atom.
Element: particular type of atom cannot be broken down into simpler substances by ordinary chemical means (H, O, C, Ag)
Compound: made of atoms of different elements chemically combined in a certain ratio (H₂O)
Ion: an atom that has gained or lost an electron
atom: smallest most basic unut of matter.
12. Name the two parts of the chemical reaction: **Reactants --> products**



13. Draw and label a pH Scale.

14. Distinguish between acid and base. Give example of each.

Acid: releases H⁺ ions in water (pH 0-7) Ex) Vinegar

Base: releases OH⁻ in water (pH 7-14) Ex) baking soda

Converting metrics

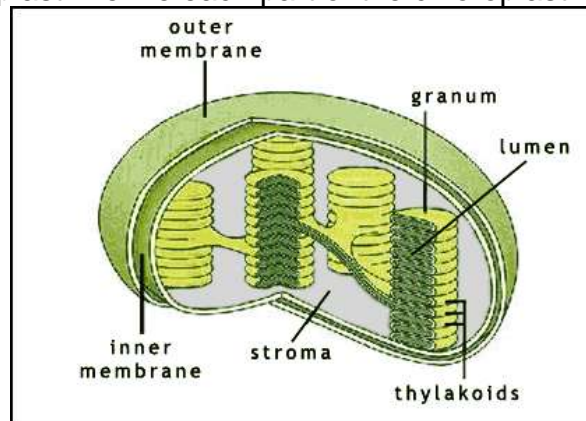
K H D (base) d c m

ENERGY

1. What is the overall equation for photosynthesis? **$6\text{H}_2\text{O} + 6\text{CO}_2 \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$**

2. In what part of the cell does photosynthesis take place? **Chloroplast**

3. Draw and label a chloroplast. Define each part of the chloroplast.



4. Name the pigment that is responsible for absorbing the light energy from the sun during photosynthesis. **Chlorophyll**

5. What are the 2 types of reactions that occur during photosynthesis? **Light-dependent and light-independent reactions**

6. What is another name for light independent reactions? **Calvin cycle**

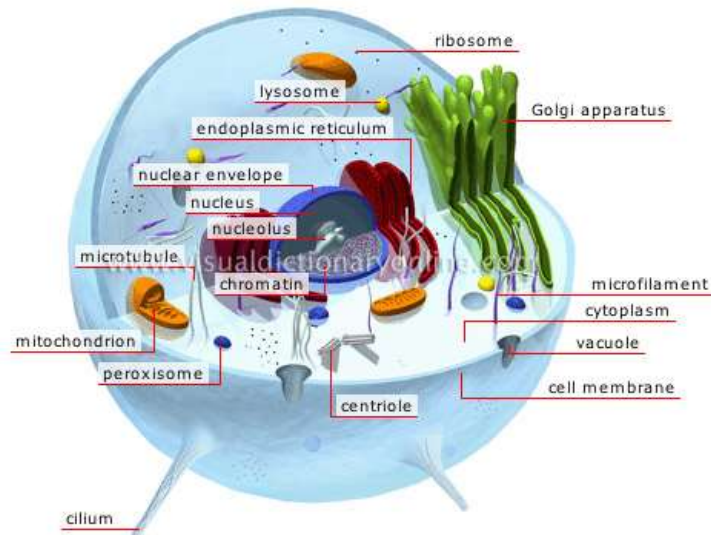
7. What part of the chloroplast contains chlorophyll? **thylakoids**

8. What is the overall equation for cellular respiration? **$\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{H}_2\text{O} + 6\text{CO}_2$**

9. In what part of the cell does cellular respiration take place? **mitochondria**
10. What is ATP? **Adenosene triphosphate a molecule that transfers energy from the breakdown of food molecules to cell processes**
11. How man ATPs are produced (net) when cellular respiration is finished? **34**
12. What is fermentation? **Process that occurs without oxygen present that allows glycolosis to continue does not produce ATP**
13. What are the 2 types of fermentation? Describe each type.
Lactic acid fermentation- *occurs in muscles *glycolysis splits glucose into pyruvate molecules *pyruvate enters fermentation *pyruvate converted to lactic acid (found in muscles during anaerobic/weight bearing exercises)
- Alcoholic fermentation- *similar to lactic acid *glycolysis splits glucose and products enter fermentation *pyruvate splits into alcohol and CO₂ (beer, wine, etc)**
14. What is the difference between aerobic respiration and anaerobic respiration?
Anaerobic does not require oxygen
Aerobic requires oxygen

CELLS

1. Explain the difference between plant cells and animal cells.
Plant cells have chloroplast, central vacuole and cell wall
Animal cells have centriole and lysosomes
Rest of the organelles they both have.
2. Explain the difference between eukaryotic cells and prokaryotic cells.
Eukaryotic has nucleus and other membrane bound organelles; nucleus encloses genetic material; can be multi-cellular or single-celled
Prokaryotic no nucleus, no membrane bound organelles, DNA suspended in cytoplasm, single-celled only
3. What are the parts to the cell theory?
- **All organisms are made of cells**
 - **all exsisting cells are produced by other living cells**
 - **cell = most basic unit of life**
4. Draw and label a picture of an animal cell including the names and functions of the structures located in the nucleus and the cytoplasm.



cell membrane The cell's flexible outer casing; it separates the cell from the surrounding environment and works as a filter to control the entry and exit of certain substances.

chromatin Mass of very fine filaments of DNA, the genetic material of the cell; it is compressed into chromosomes during cell division.

nucleus Organelle containing a cell's genes and controlling its activities.

ribosome Organelle, free or attached to the endoplasmic reticulum, producing proteins essential to the constitution and functioning of living beings.

endoplasmic reticulum Organelle formed of walls to which the ribosomes are attached.

mitochondrion Ovoid organelle that produces the energy necessary for cell activity.

cytoplasm Clear gelatinous substance surrounding the various cellular structures.

vacuole Spherical cavity containing water, waste and various substances required by the cell.

lysosome Small spheroid organ containing enzymes that break down food, spent cell components and other harmful substances that have been absorbed.

nuclear envelope Envelope formed of two layers surrounding the nucleus and pierced with small holes, which allow exchanges between the cytoplasm and the nucleus.

nucleolus Small spherical body located inside the nucleus, within which the ribosomes, or protein-synthesizing structures, are produced.

centriole Structure consisting of small rods that play a major role in cell division. Each cell usually contains two.

Golgi apparatus Organelle composed of a series of pockets that receive proteins produced by the ribosomes and either transport them outside the cell or to other organelles.

5. List and describe the types of passive transport.

- **Diffusion-** any molecule moving across the membrane from High to low concentration until evenly distributed.
- **Facilitated diffusion-** larger molecules moving from high to low concentration through use of protein channels
- **Osmosis-** diffusion of water across semi-permeable membrane

6. Explain the differences between hypotonic, hypertonic, and isotonic.

Hypotonic: lower concentration of particles inside CELL SWELLS

Hypertonic: higher concentration of particles inside CELL Shrivels and gets smaller (less water)

Isotonic: equal concentration in and out of the cell

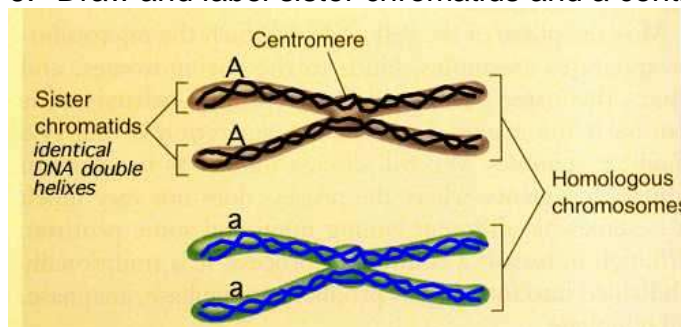
7. List and describe the types of active transport.

Endocytosis- process of taking material into a cell

Exocytosis- process of getting rid of material from a cell

HEREDITY

1. Define chromosome. **Long continuous thread of DNA that consists of numerous genes and regulating information.**
2. How many chromosomes do humans have? **46; 23 pairs**
3. Where are chromosomes located in the prokaryote cell? **Cytoplasm**
A eukaryotic cell? **Nucleus**
4. Define karyotype. What is a karyotype used for? **Image of all the chromosomes in a cell used to identify chromosomes, put in order research traits and diseases on particular chromosomes and genes.**
5. What is the difference between chromatid and a chromosome? **Half of a chromosome pulled apart in anaphase. Chromosome are 2 sister chromatids attached at centromere.**
6. Draw and label sister chromatids and a centromere



7. Define the cell cycle. **Pattern of growth, DNA replication, and cell division that occurs in a eukaryotic cell.**

8. What are the 3 main steps to the cell cycle? Define each step.

Interphase- growth, getting ready to divide, normal functions and DNA replication and checkpoint

Mitosis- nucleus divides

Cytokinesis- cell/cytoplasm divides.

9. What is the first phase of the cell cycle? **Interphase**

10. What are the 3 phases that make up the first phase of the cell cycle?

11. Define phases.

Gap1- cell growth, normal functions, organelle replication

Synthesis- DNA replication

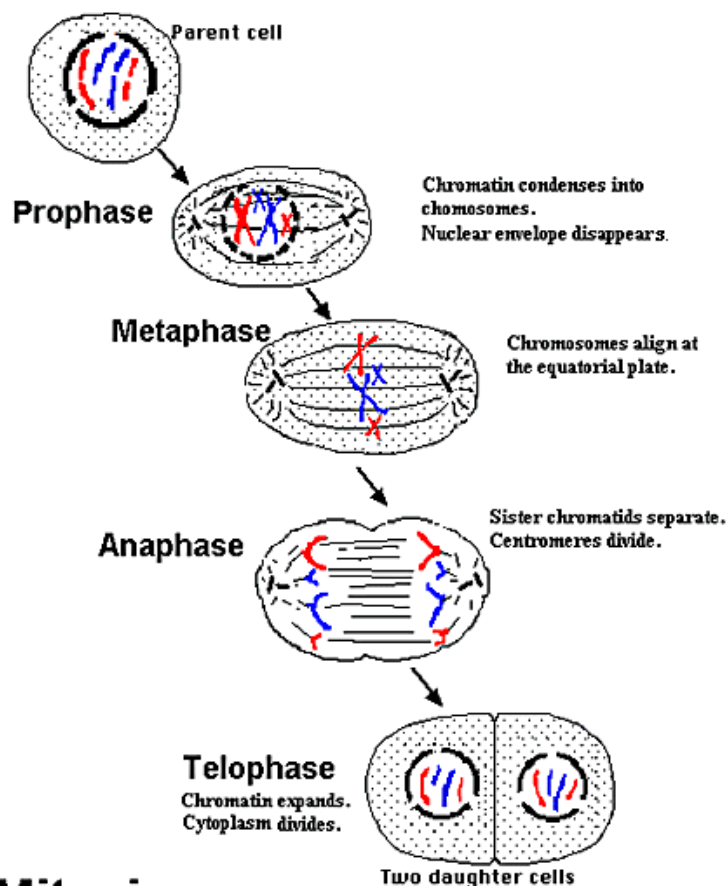
Gap2- Cell growth and checkpoint

12. What is the 2nd phase of the cell cycle? **Mitosis**

13. What are the 4 phases of the second phase of the cell cycle? IN ORDER.

Prophase, Metaphase, Anaphase, Telophase

14. Draw, label, and describe what happens in each phase mentioned in #13.



Mitosis

15. Define spindle, centriole and aster.

Spindle- helps with pulling apart DNA

centriole- small cylinder shaped organelle made of protein tubes arranged in a circle; aids in mitosis

aster- star shaped structure fibers like rays surround centrosome in mitosis

16. In what phase(s) of mitosis does cytokinesis begin? **Late anaphase → telophase**

17. Describe the differences between mitosis and meiosis. Be very specific.

Mitosis	Meiosis
2 diploid cells	4 haploid cells
1 set of PMAT	2 sets of PMAT
Same amount chromosomes parent and daughter cells	Daughter cells have $\frac{1}{2}$ the chromosomes

18. What is the difference between parent cell and daughter cell? **Parent cells creates daughter cells & they are exact copies of each other (daughter cells in Meiosis $\frac{1}{2}$ chromosomes)**

19. What is the difference between haploid and diploid?

Haploid	Diploid
Half of chromosomes	Twice # chromosomes
Results in gametes (egg and sperm)	Results in normal body cells

20. How many daughter cells are produced from mitosis? **2** Meiosis? **4**

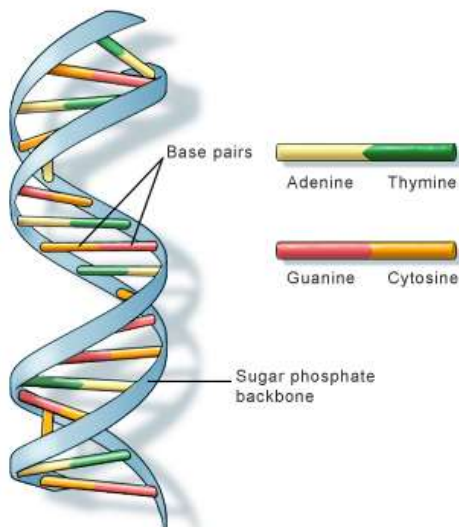
21. How is the chromosome number changed in mitosis? **Not changed** Meiosis? **$\frac{1}{2}$ chromosomes**

22. Name some reasons cells divide? **Surface area doesn't keep pace with volume, need to replace cells, growth of organism**

23. What is cancer? **Cells that have a genetic or environmental mutation that causes them to rapidly divide.**

24. Define tumor. **A grouping of cancerous cells**

25. Describe the basic structure of DNA. **Double helix with sugar and phosphate sides, nitrogen base pairs of rungs and hydrogen bonds**



26. What are the building blocks of DNA and RNA?

Nucleotides

27. What is the sugar in DNA? **deoxyribose** In RNA? **Ribose**

28. Where is DNA located in a cell? **Eukaryotes- nucleus/ prokaryotes- cytoplasm**

29. In which phase of the cell cycle is DNA replicated? **Synthesis**

30. Describe the base-pairing rule for DNA and for RNA.

DNA	A -T	C- G	
RNA	A-U	T-A	C-G

31. Who discovered DNA? **Watson & Crick (& Rosalind Franklin)**

32. Explain the process of DNA replication. **The strands are split into two and then DNA ribose connects the correct nucleic acids to the split DNA strands until there is 2 new, identical strands.**

33. What are chromosomes made of? **DNA (chromatin that wind up around histones into sister chromatids.**

34. Explain the differences between DNA and RNA.

DNA	RNA
Holds genetic information	Template for formation of proteins
2 strands	1 strand
AT GC	AU GC

35. Describe the process of protein synthesis. **The process of transcription and translation to form amino acids and then proteins**

36. Define transcription. **1. RNA polymerase recognizes start of gene and begins to unwind the DNA. 2. RNA polymerase reads one side of the DNA template and strings together a complementary strand of RNA nucleotides. 3. The growing RNA strand hangs freely as it is transcribed and detaches completely once entire gene is transcribed.**

37. Define translation. **1. mRNA leaves the nucleus, tRNA brings free nucleotides both meet at ribosome. The start codon complementary tRNA pairs with the exposed codon. (groups of 3 bases). 2. Ribosome helps bond the amino acid to the start codon and breaks the bond between the amino acid and first tRNA. 3. Ribosome pulls the RNA strand the length of one codon, first tRNA returns to cytoplasm another codon is exposed for tRNA binding. Sets of codons are chained together with peptide bonds to make a protein.**

38. Define codon. **3-nucleotide sequence that codes for an amino acid.**

Define anticodon. **Set of 3 nucleotides that is complementary to an mRNA codon.**

39. Define mutation. Name some ways mutations occur. **Mutation is a change in an organism's DNA. It can be inherited or acquired (environmental)**

40. Define frameshift mutation: **inserts or deletes a nucleotide(s) in DNA sequence, changing the reading frame.**
Define point mutation: **substitutes one nucleotide for another.**
41. What is the difference between gene mutations and chromosome mutations. **Gene mutations affect only 1 gene. In chromosome mutations, actual DNA segments are exchanged through crossing over and affect many genes on that chromosome the whole "reading frame."**
42. Define amino acid. **Molecule assembled at the ribosome that makes up a protein made of 3 nucleotides (codon)**
43. What are the 3 types of RNA? **They are mRNA, tRNA, rRNA (messenger, transfer and ribosomal)**
44. Define:
- genotype- **genetic makeup (AA, Aa, aa) Homozygous dominant, heterozygous, homozygous recessive**
 - phenotype- **physical characteristics that result from heredity (Tall, short)**
 - dominant- **Allele that is expressed or shown (Capital letter in genotype)**
 - recessive- **allele that is not expressed or shown (lower case letter in genotype)**
 - heterozygous- **two different alleles in genotype (Aa)**
 - homozygous- **two same alleles in genotype (AA or aa)**
45. Describe the work of Gregor Mendel. **Monk who experimented w/pea plants. Cross between 2 purebred plants result in one phenotype. F2 generation has 3:1 ratio of phenotype. Came up with law of independent assortment and law of segregation. That one factor comes from each parent independently. Known as the Father of genetics.**