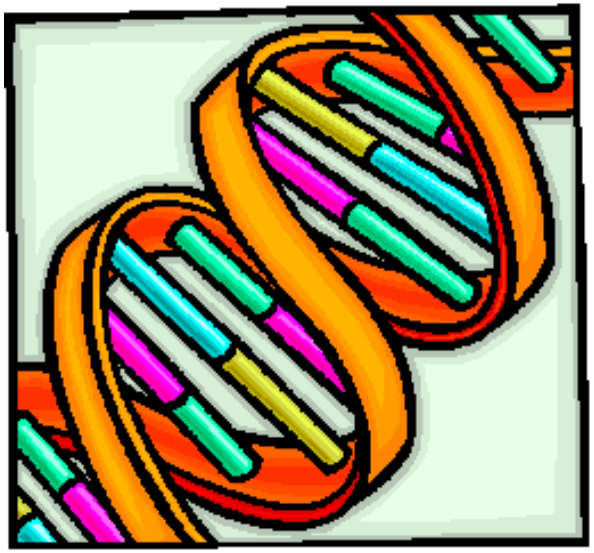
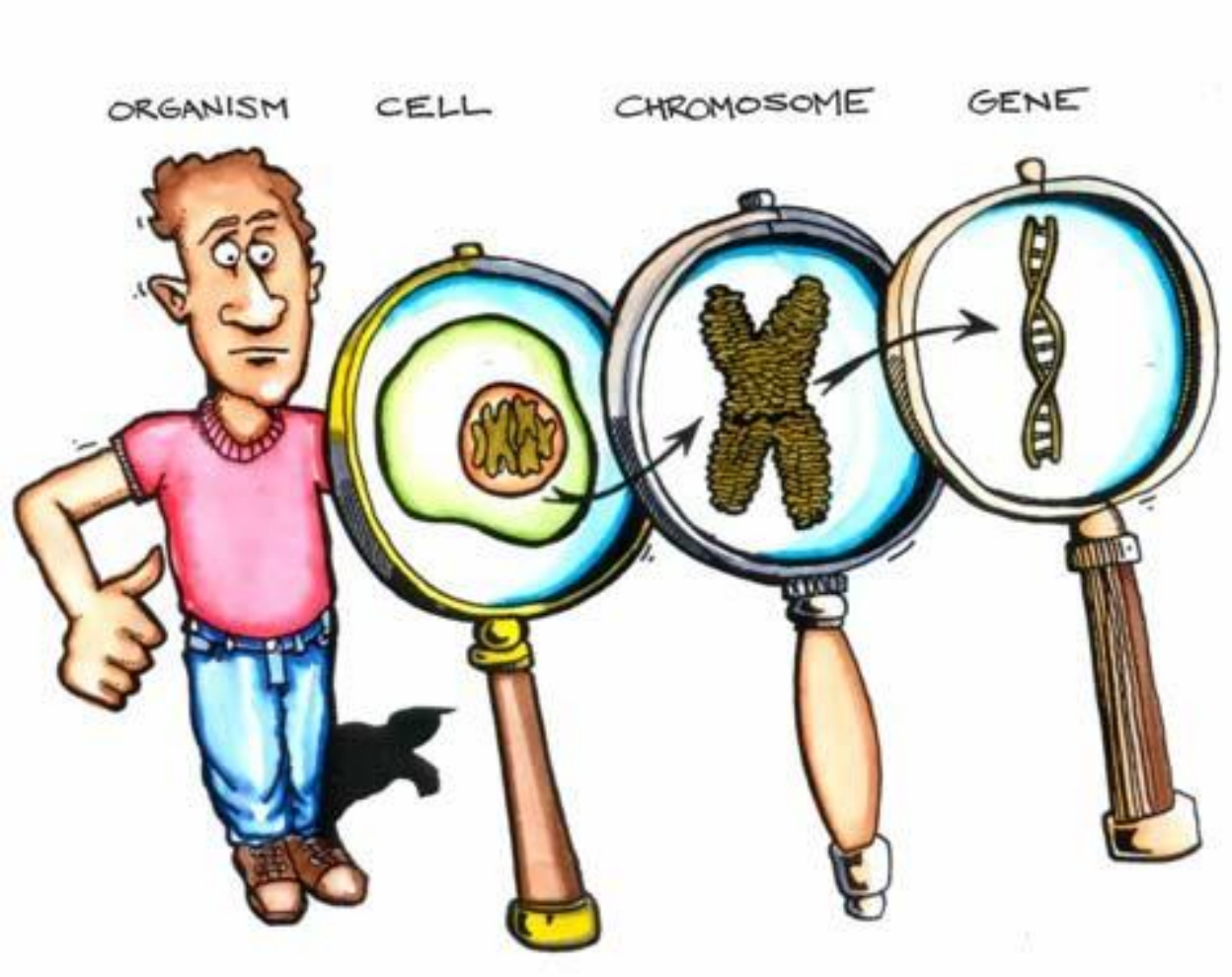
Let’s Play with DNA

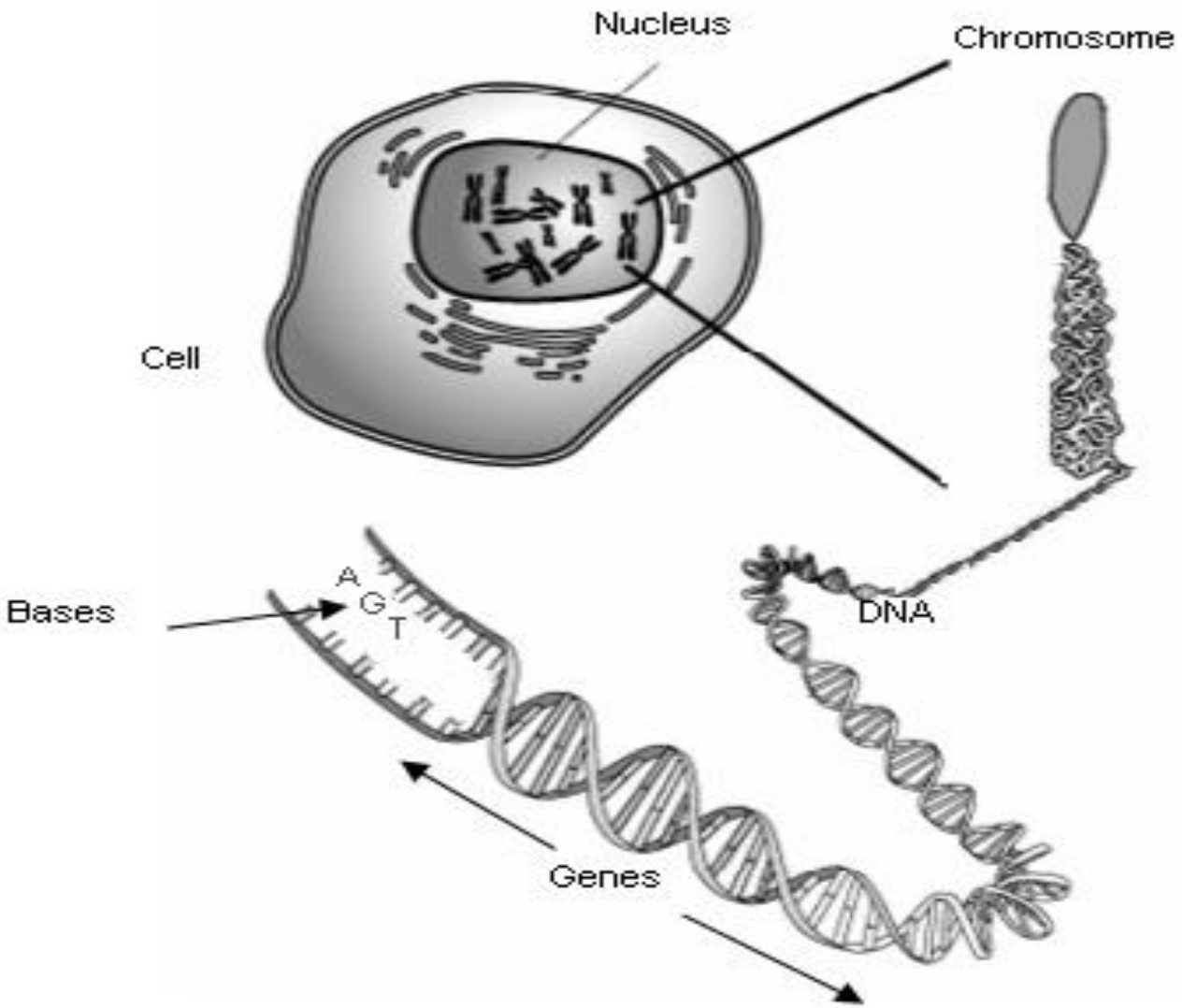


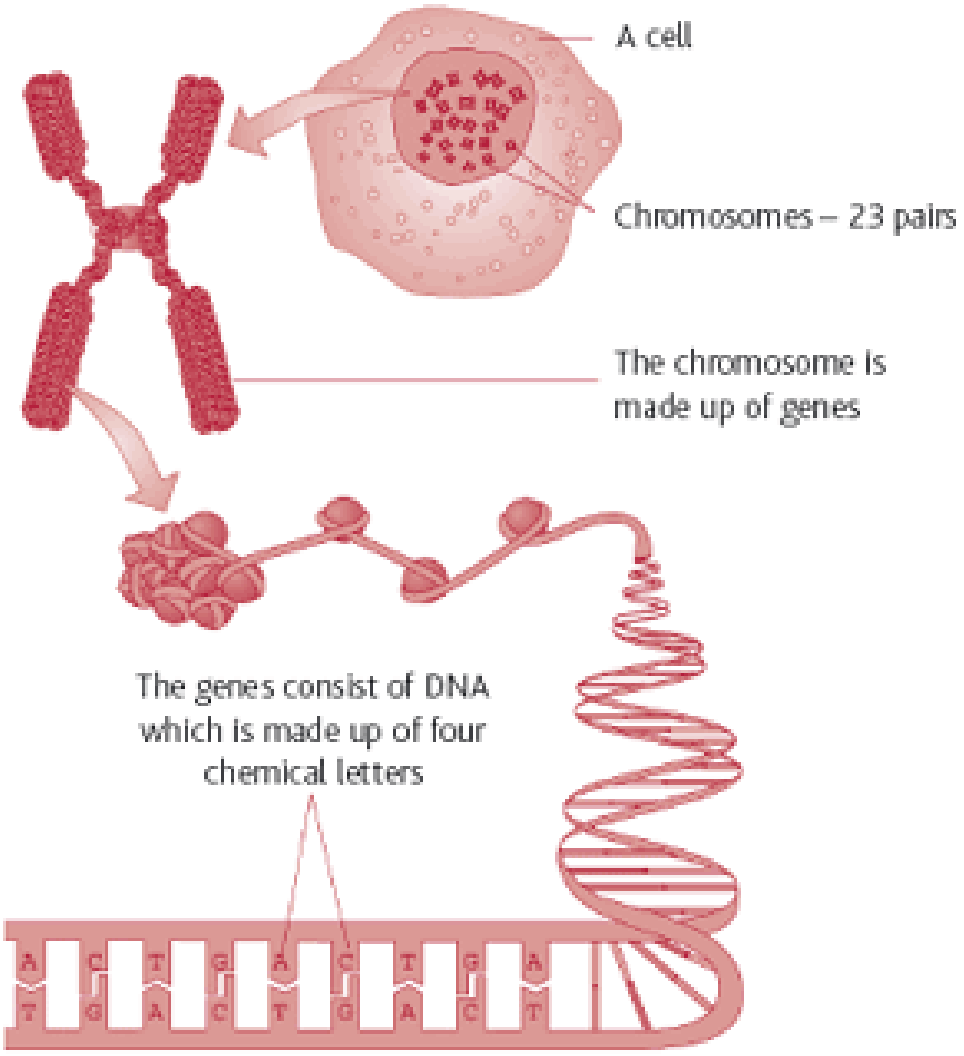
PAF Educational Conference 2013

Denver, Colorado

Cindy Freehauf, RN, CGC

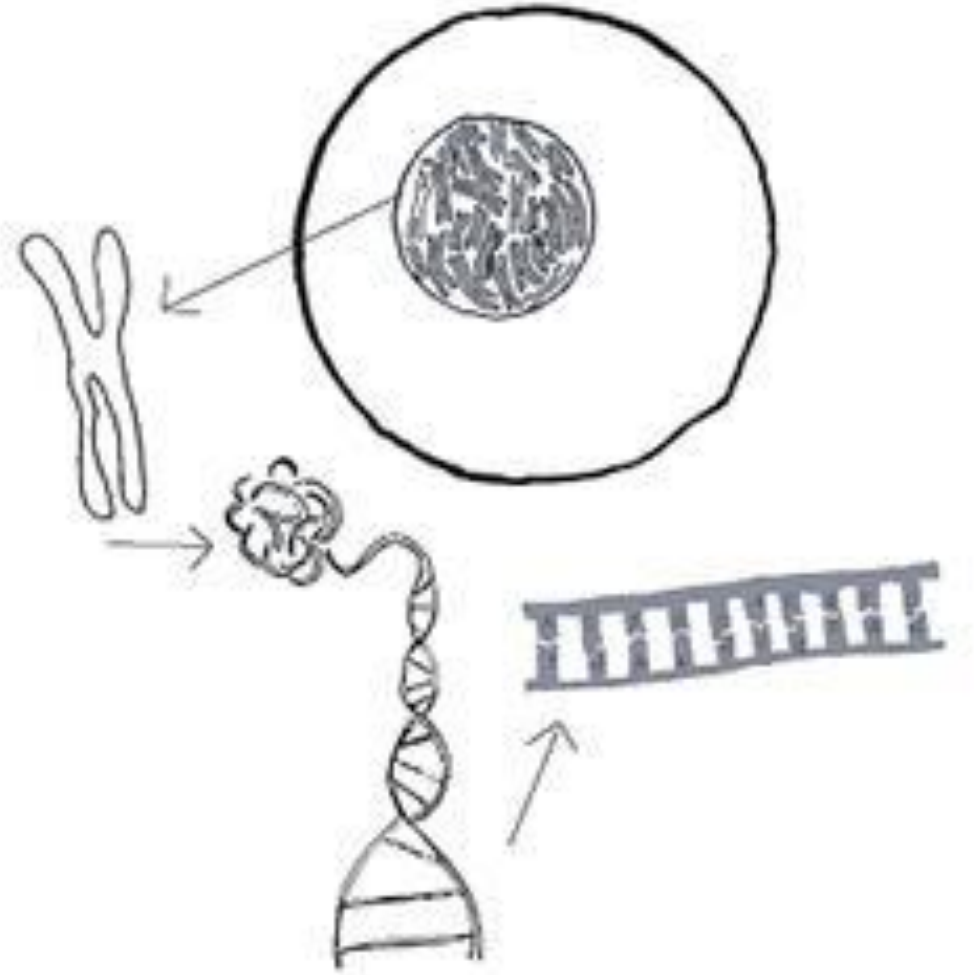

ORGANISM
CELL
CHROMOSOME
GENE


Nucleus
Chromosome
Cell
Bases
A
G
T
DNA
Genes

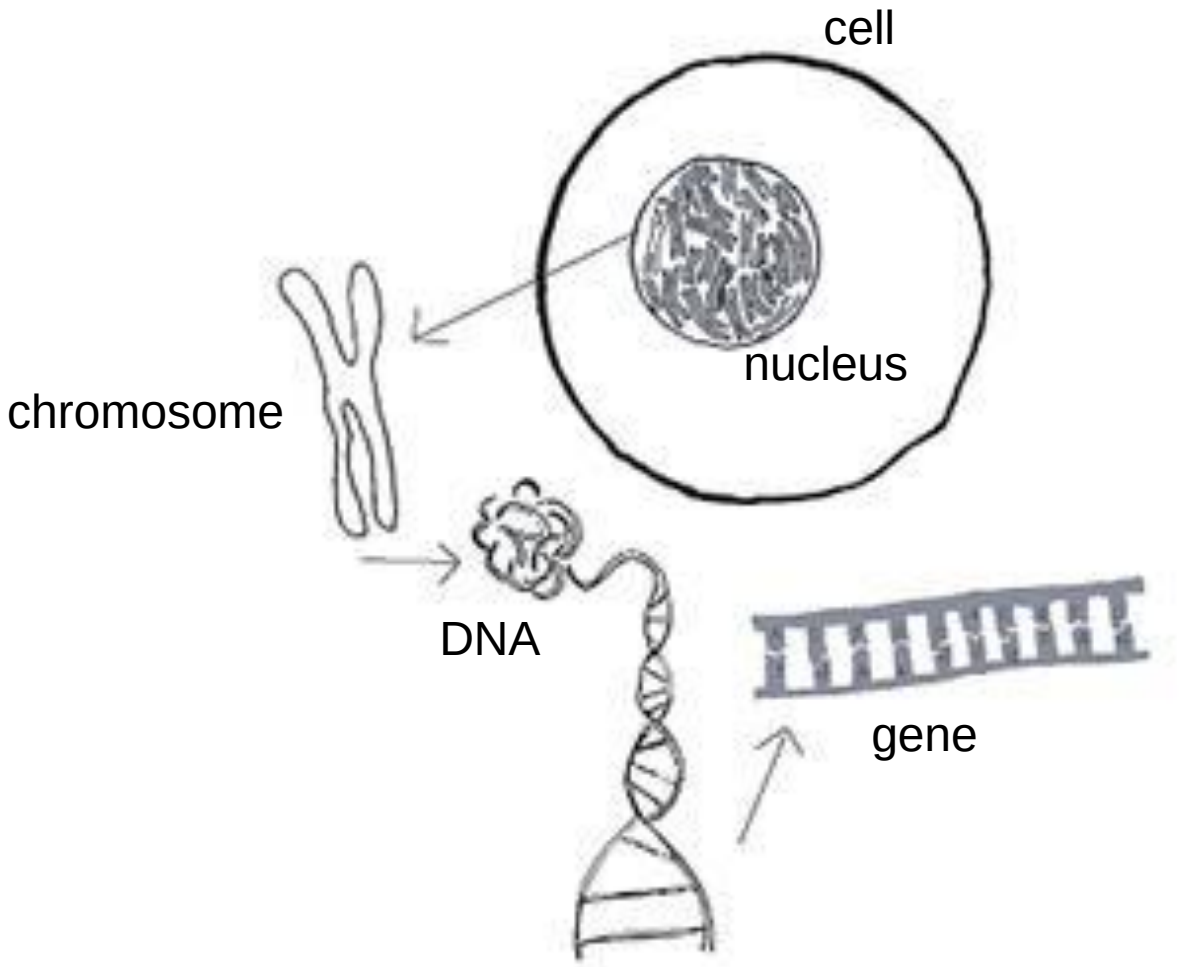

A cell
Chromosomes – 23 pairs
The chromosome is made up of genes
The genes consist of DNA which is made up of four chemical letters

Label the diagram using these words:

- DNA
- gene
- chromosome
- nucleus
- cell



Adapted from Genes and You
http://www.geneticalliance.org.uk/docs/genesandyou/activities/Gen-chrom-dna.pdf



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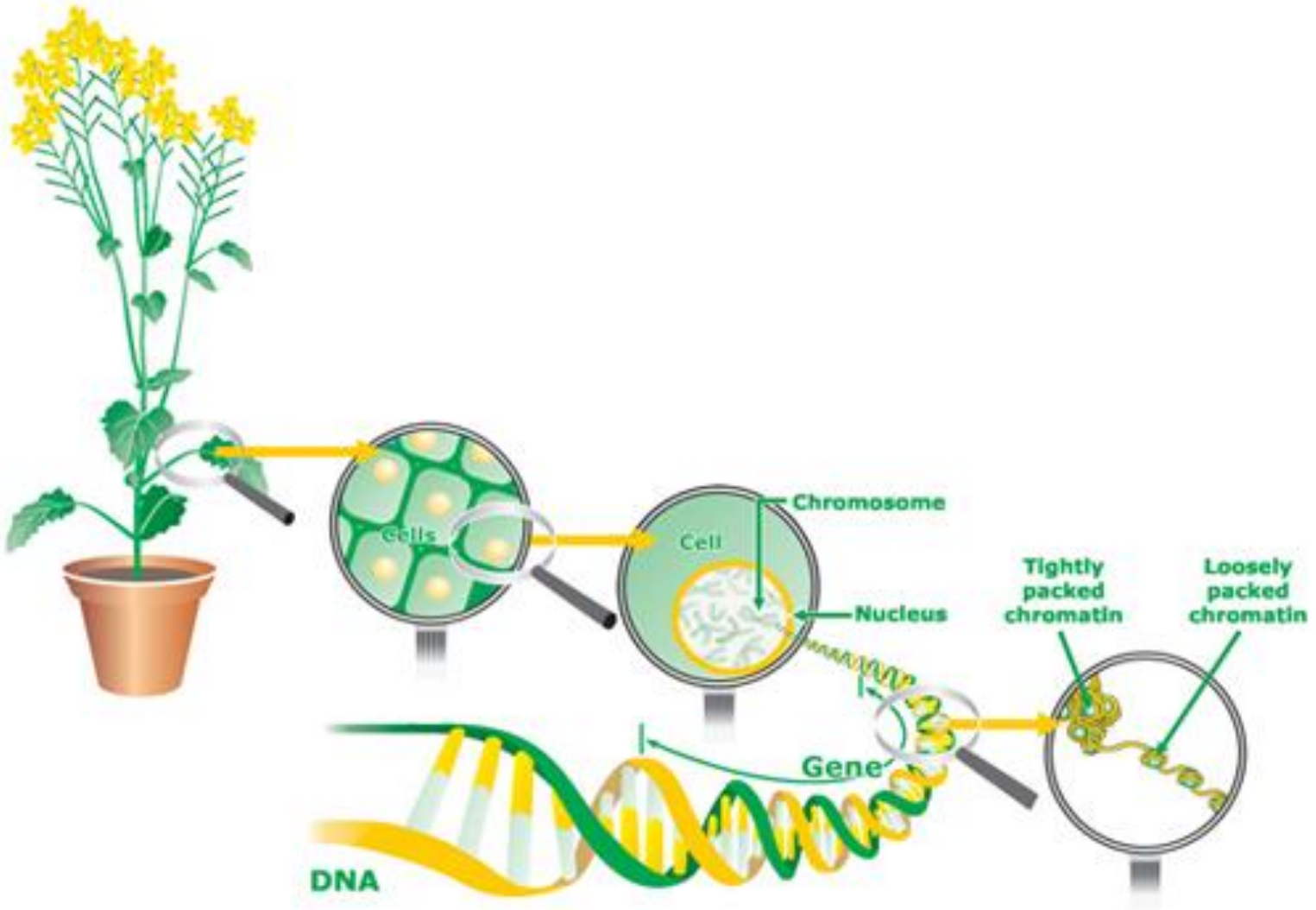

Cells
Cell
Chromosome
Nucleus
Tightly packed chromatin
Loosely packed chromatin
Gene
DNA

DNA Extraction Experiment

1. Using the graduated cylinder, measure out 100 mL of water and pour it into the plastic cup.

2. Add 1 large spoonful of wheat germ to the water and mix using a plastic spoon.

3. Add one pump of liquid soap, stir for 1 minute.

DNA Extraction Experiment

4. Add 1 small spoonful of meat tenderizer and 2 small spoonfuls of baking soda. Stir to mix

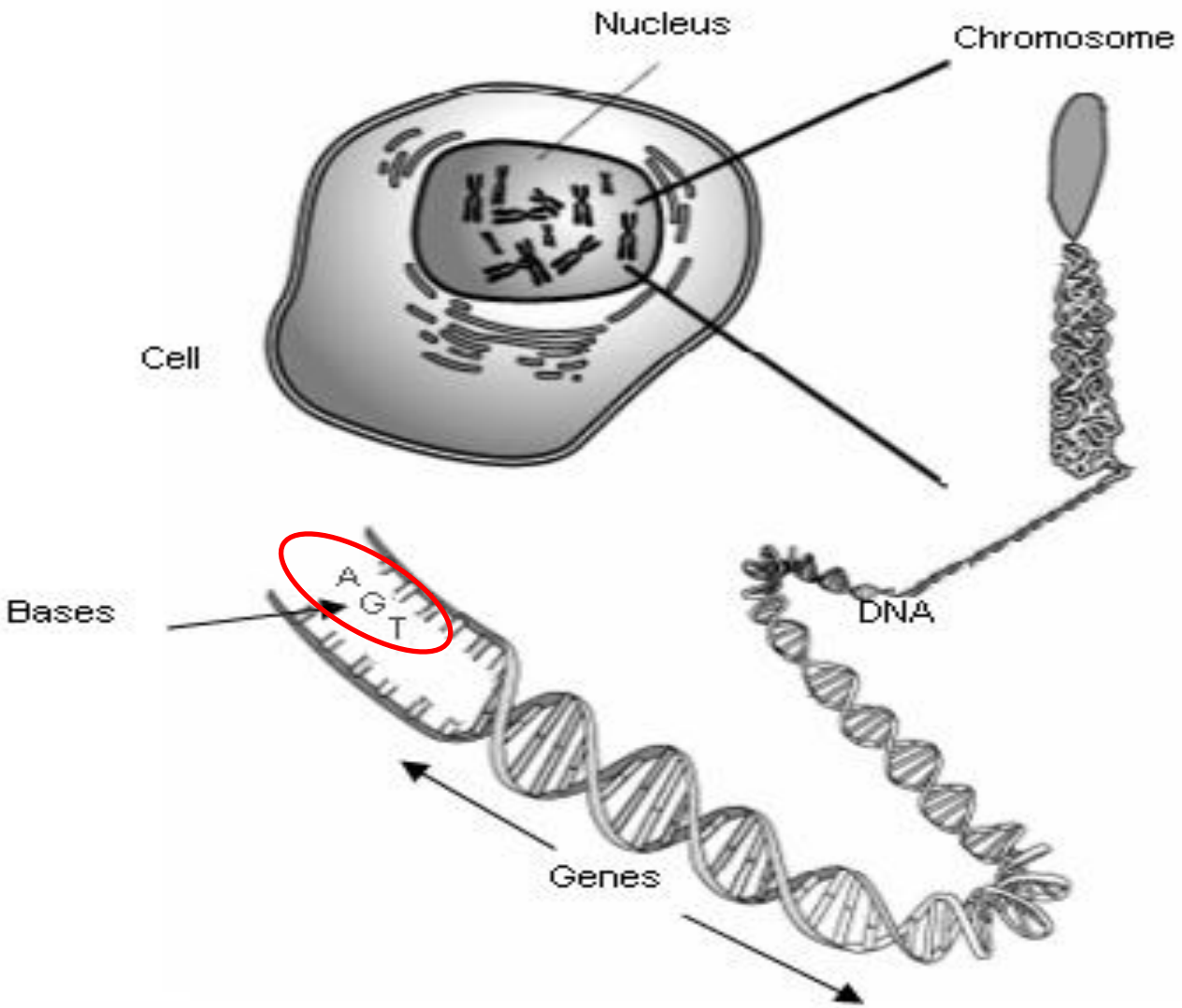
5. Stir for 1 minute. Strain the wheat germ solution by putting a metal sieve over a plastic cup and pouring the wheat germ solution into the sieve.

DNA Extraction Experiment

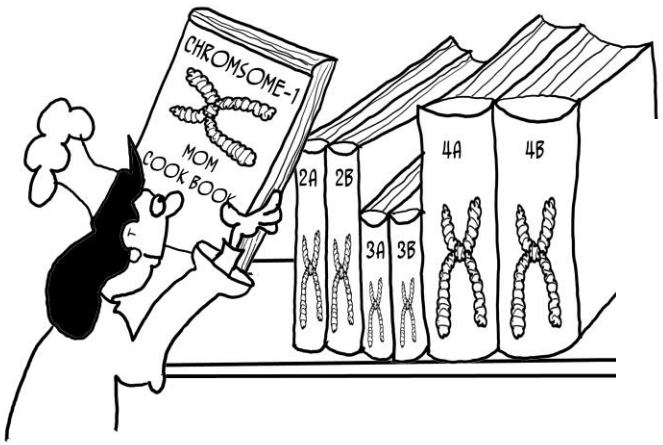
6. Once the wheat germ has settled, remove the sieve and transfer approximately 3 mL of the wheat germ liquid in the cup to a tube.

7. Dribble about 3 mL of alcohol down the side of the tube.

   - Try not to mix the two layers
   - Let the tube sit for about 5 minutes


Nucleus
Chromosome
Cell
DNA
Bases
A
G
T
Genes

Gene = Recipe for making enzymes



IN THE DNA KITCHEN

EXOTIC, HONEY AND BLACKBERRY ICE TEA RECIPE/GENE

. . .add one cup tea and add ice and mix end

. . .add one kup tea and add ice and mix end

. . .add one cup sea and add ice and mix end

. . .add one cup tea end

. . .ado nec upt eaa nda ddi cea ndm ixe nd

. . .add one ciu pte aan dad dic ean dmi xen d

Point Mutation SILENT
Point Mutation MISSENSE
Point Mutation NONSENSE
Deletion
Insertion

Two Layer Cake

Frosting Recipe

-4 ounces dark chocolate
--5 cups sugar
--3 oz cream cheese

-Mix and spread

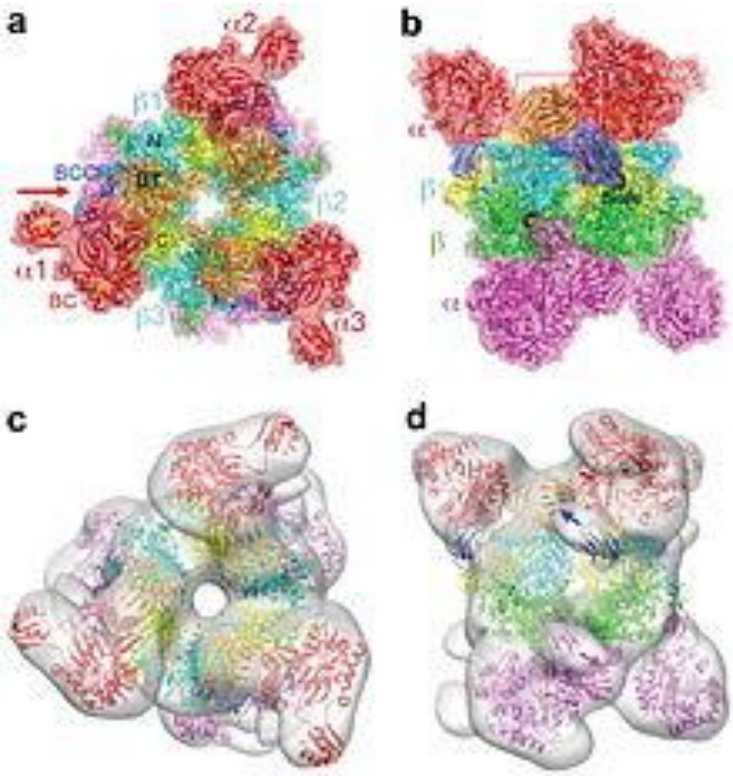
Cake Recipe

-@ cups flow
--2 cups sugar
-½ cup oil
-4 ounces dark chocolate
-2 eggs

-Mix together at high speed for 3 min
-Pour into round cake pans
-Bake at 350 degrees for 30 minutes

Propionyl-CoA Carboxylase (PCC)

alpha(6)-beta(6)-dodecamer



PCCA Recipe

Make 6 batches

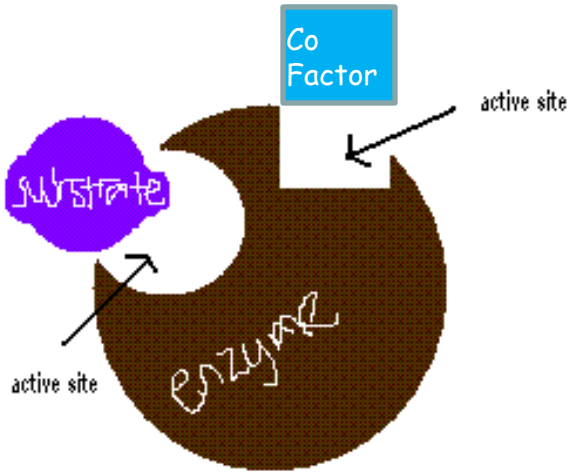
GGATTCTTTTATTTCTGTCAGCTATCTCACCTAGGCAACCTCTCTG
TACTCTGGCTGAGTACTGAGTTTGGGGACCCCAATTTTGGTCCTC
AAGGCTTTAACTTAGCACTGAGCCAAGTAGCTTCCCAGCTCCTCT
CTCTCTGGAGCTCAATACGTAGCTCACAAAACATTTCAGTCTTGA
CTTCTGTTCCTGTGTATCCCATCTCTGAAATCTGGATATAAATTAT
TTAAGAGCAAAACCTGGCACAGCATTTGGTAAAAGTTGGTCAGAT
TTTTGGGGGGAAGAGGGTCGACGAAGCCTGGAGTTTAGATGGCT
ATGAAGTCCTTGTTCTGTGTGGCTACACGGGCACAGAGCTGAGA
AACAGGACCGCCTTGAGCCTGAATGCAAGCCTGTGACTGCTACC

PCCA Recipe

Make 6 batches

CTCTCTGGAGCTCAATACGTAGCTCACAAAACATTTCAGT
CTTGACTTCTGTTCCTGTGTATCCCATCTCTGAAATCTGG
ATATAAATTATTTAAGAGCAAAACCTGGCACAGCATTTGG
TAAAAGTTGGTCAGATTTTTGGGGGGAAGAGGGTCGACG
AAGCCTGGAGTTTAGATGGCTAACGCAGAACGAGGA
ATGAAGTCCTTGTTCTGTGTGGCTACACGGGCACAGATG
AACAGGACCGCCTTGAGCCTGAATGCAAGCCTGTGACTG

For an Enzyme, Shape is Everything



- Altered shape leads to
  - decreased or inability to do job
  - early degradation in the cell
- “Chaperones” help enzymes obtain and keep proper shape

Mutation Nomenclature

c.C862T

Coding DNA

Address Where Change Takes Place

Original Letter
Substituted Letter

p.R288X

Protein Product (

Address Where Change Takes Place

Original Ingredient
Substituted Ingredient

Mutation Nomenclture

- Missense point mutation PCCA gene
  - **c.G148C**

    the 148th letter in the gene (recipe) was changed from G to C
  - **p.A50P**

    the 50th ingredient in the enzyme was changed from alanine (A) to proline (P)

Mutation Nomenclature

- Nonsense point mutation
  - **c.C862T**

    The 862nd letter in the gene (recipe) was changed from C to T
  - **p.R288X**

    The above noted change in the gene creates a early “stop sign” in the gene. Arginine (R) should have been added as the 288th ingredient; however, nothing (X) is added.

Mutation Nomenclature

- Deletion mutation
  - **c.440delC**

    The 440th letter in the gene (recipe), this being C, was deleted
  - **p.S147X**

    The above noted change in the gene creates a early “stop sign” in the gene. Serine (S) should have been added as the 147th ingredient; however, nothing (X) is added.

Mutation Nomenclature

IVS

Intervening Sequence

Advertisement in the Middle of the Gene

Is Cut Out

Mutation Nomenclature

- Mutation in IVS
  - **c.IVS7-2delA**

    In the 7th IVS, the second letter, A, was deleted

DNA Extraction Experiment

8. Carefully swirl a rod at the interface of the two layers using small circles to spool or wrap the DNA around the rod.
    - If you keep swirling and are careful not to mix the two layers, you might be able to pull out a big wad of DNA.
9. When you are finished, scrape your DNA clump off the stirring rod into the cup and place all the liquids in the disposal bucket.