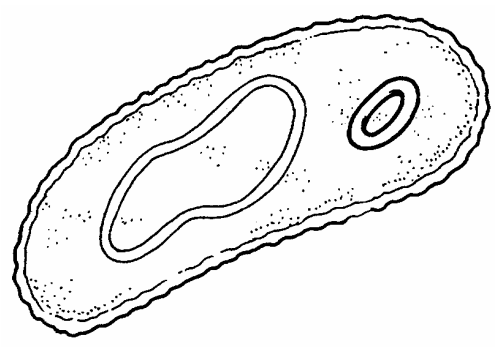
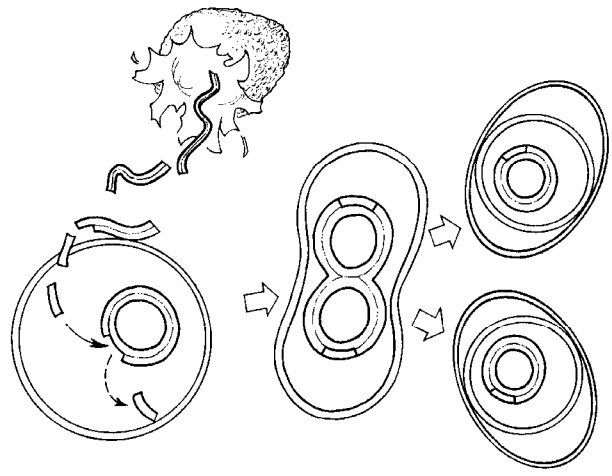
AP BIOLOGY NAME___ _____
MOLECULAR GENETICS
ACTIVITY #5 DATE__ _____HOUR____

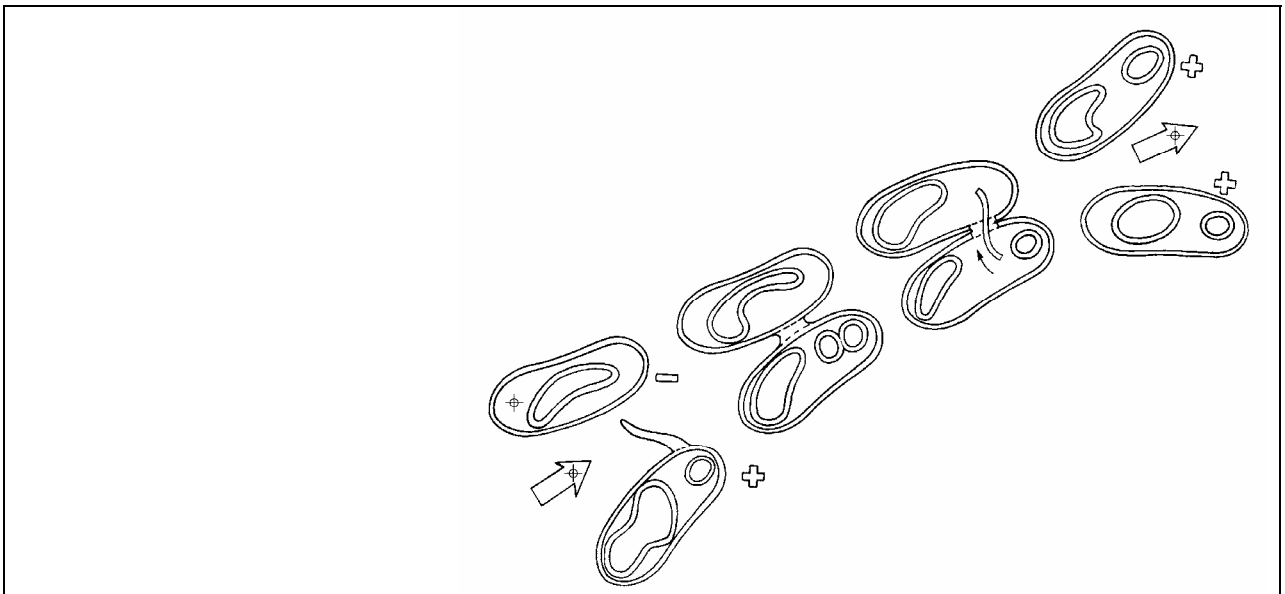
PROKARYOTIC AND EUKARYOTIC GENOME

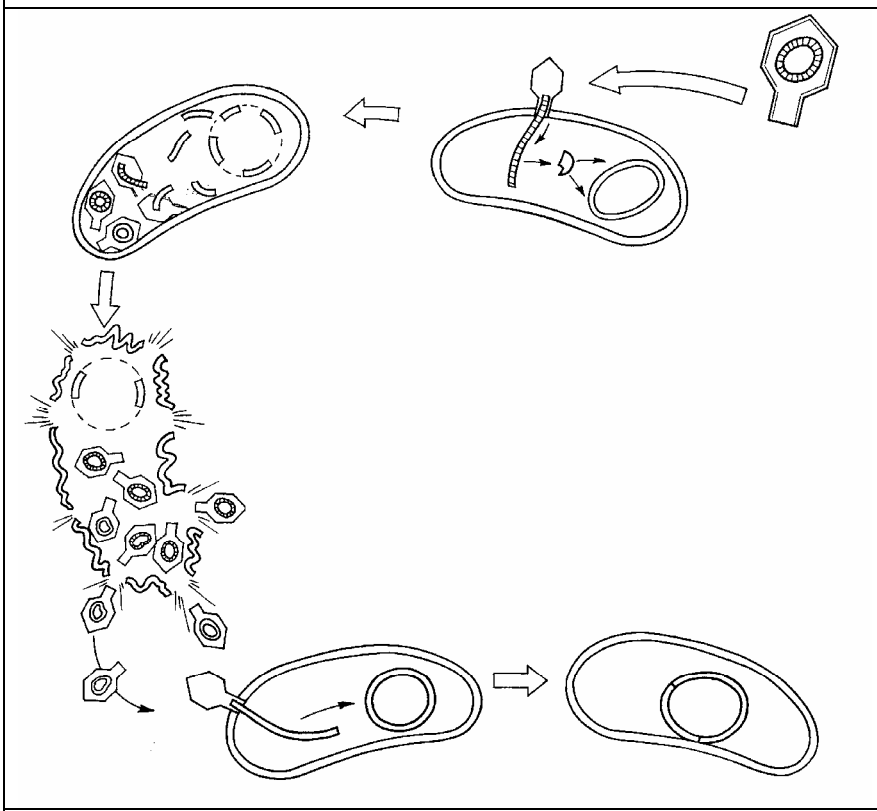
PROKARYOTIC GENOME



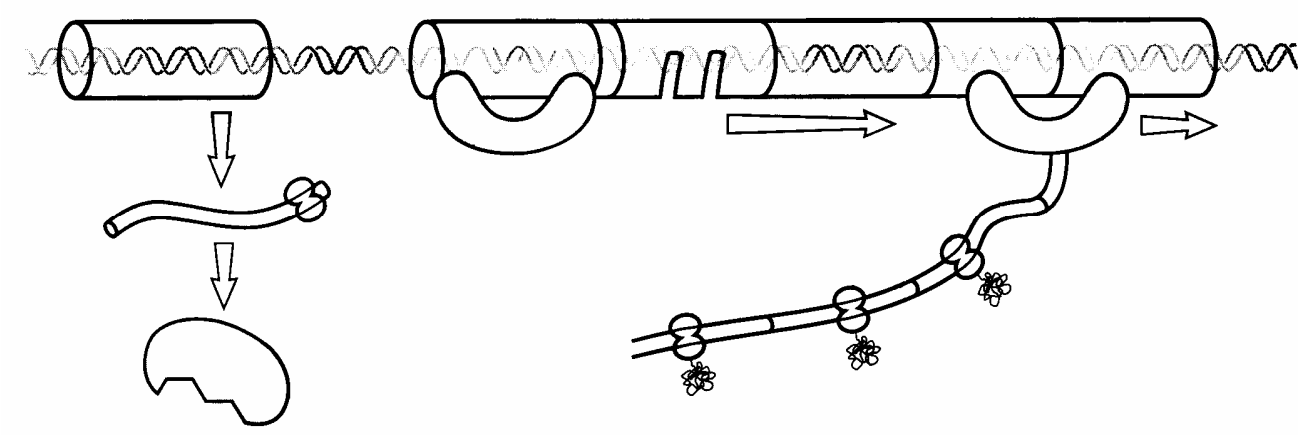
SOURCES OF VARIATION AND RECOMBINATION

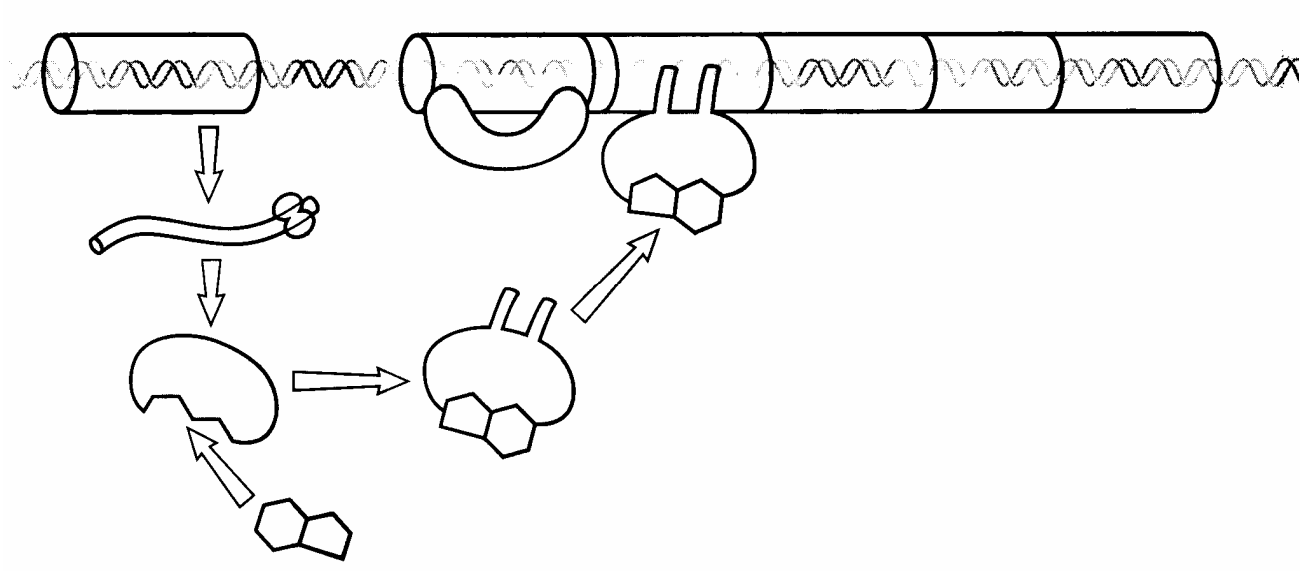




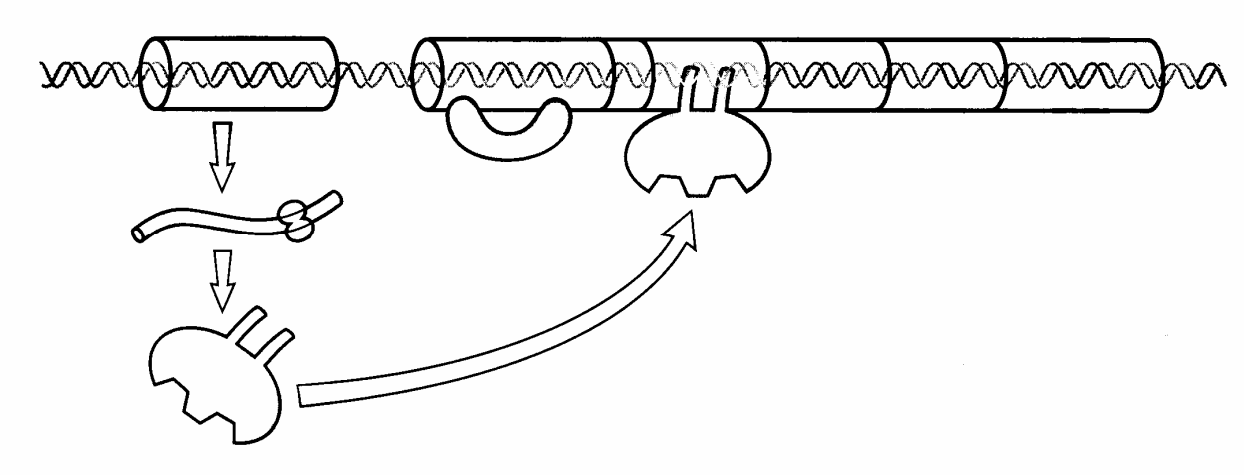


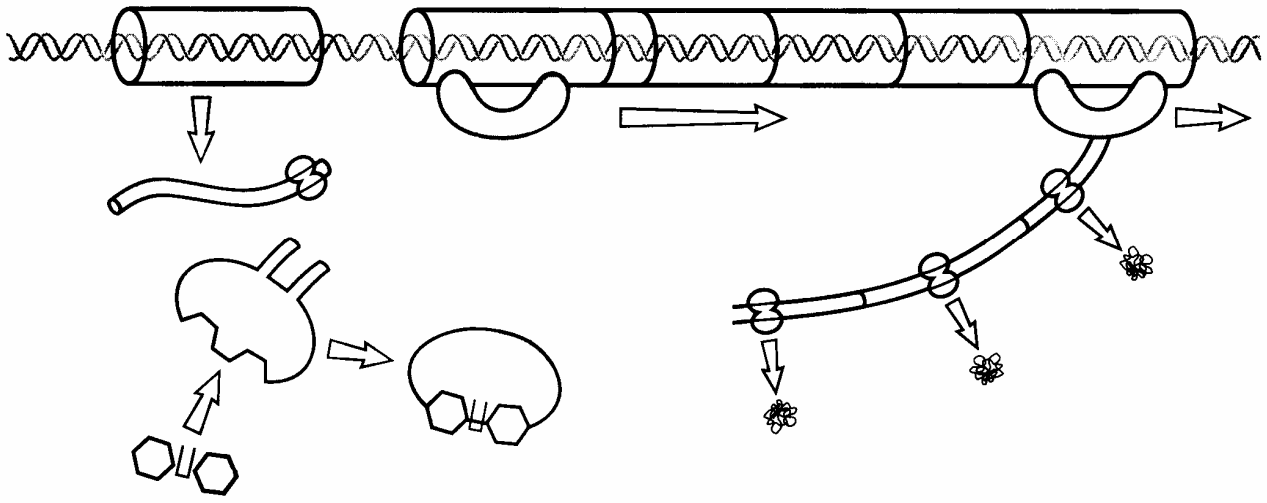
OPERONS – *TRP* OPERON



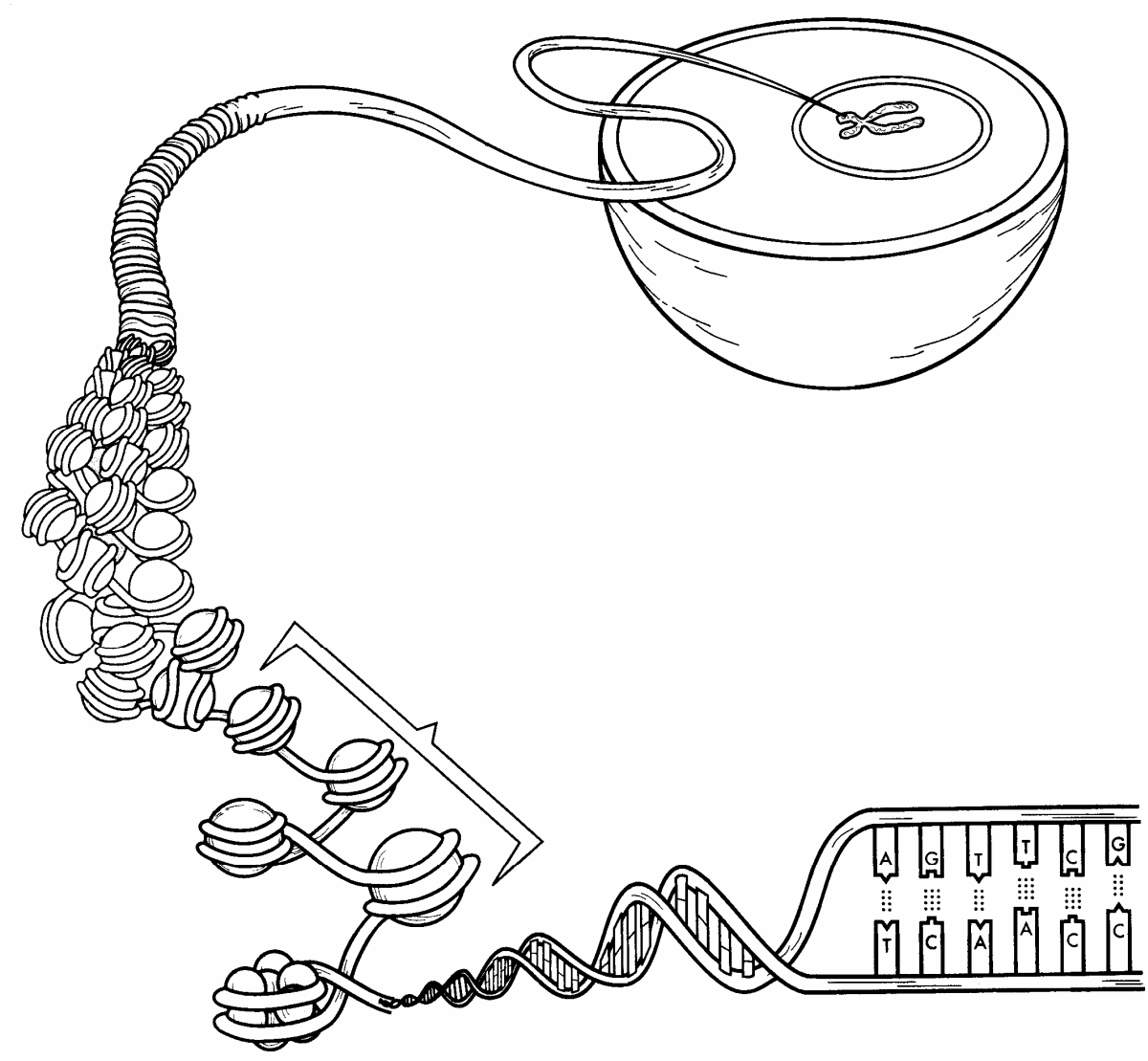


OPERONS – *LAC* OPERON





EUKARYOTIC GENOME



QUESTIONS:

1. Listed below are descriptions and examples of the different types of recombination in bacteria. Classify each type as:

   A) transformation
   B) transduction
   C) conjugation
   D) transposons

   _____ Bacteria assimilate genetic material from surroundings

   _____ Bacteria take up DNA from environment

   _____ Gene transfer from one bacterium to another via bacteriophage

   _____ Direct transfer of genes between two bacterial temporarily joined by sex pili
   _____ Jumping genes first described by Barbara McClintock

   _____ Pieces of DNA move from one location to another location in cell's genome
   _____ A DNA segment is moved from one location to another

   _____ DNA is transferred from one bacterium to another by a virus

   _____ A plasmid is exchanged between two bacteria through a pilus

   _____ Bacterial strains A and B are growing together in a colony that has been infected with viruses. After a short period of time, a new strain of bacteria is detected that is very similar to strain A buts has a few characteristics of B.
   _____ The conversion of live R strain Streptococcus pneumoniae into S strain when heat-killed S strain is added to R strain
   _____ E. coli bacteria are induced to take up the *p*BLU plasmid

2. List and describe the two main strategies used by cells to control metabolism.

METHOD OF CONTROL	DESCRIPTION OF METHOD

3. Match the description/function with the correct term.

_____ Regulated cluster of adjacent structural genes with related functions	A. Corepressor
_____ Gene that codes for polypeptide	B. Operator
_____ Transcript of several genes; translated into several polypeptides	C. Operon
_____ RNA segment between promoter & structural genes; controls access of RNA polymerase to structural gene	D. Polycistronic mRNA
_____ Specific protein that binds to operator and blocks transcription	E. Promoter
_____ Genes that code for repressor or regulators of other genes	F. Regulatory gene
_____ RNA polymerase binding site	G. Repressor
_____ Molecule that binds to repressor protein; complex then binds to operator	H. Structural gene

4. Explain how the *trp* operon works:

a. If tryptophan is absent from the cell.

_____

_____

_____

_____

b. If tryptophan is present in the cell

_____

_____

_____

_____

_____

5. Explain how tryptophan acts as a corepressor.

_____

_____

6. Match these components of the *lac* operon with their functions.

_____ β-galactosidase	A.		is inactivated when attached to lactose
_____ cAMP-CAP complex	B.		codes for synthesis of repressor
_____ lactose	C.		hydrolyzes lactose
_____ operator	D.		stimulates gene expression
_____ promoter	E.		repressor attaches here
_____ regulator gene	F.		RNA polymerase attaches here
_____ repressor	G.		acts as inducer that inactivates repressor
_____ structural gene	H.		codes for an enzyme

7. Listed below are characteristics of repressible and inducible enzymes. Identify each of the following as true of repressible or inducible enzymes.

_____ genes are switched off until a specific metabolite inactivates the repressor

_____ genes are switched on until a specific metabolite activates the repressor

_____ Generally function in anabolic pathways

_____ Usually function in catabolic pathways

_____ Pathway end product switches off its own production

_____ Enzyme synthesis is switched on by the nutrient in used in the pathway

8. Match the term with the correct definition or description.

A. 30-nm chromatin fiber
B. Euchromatin
C. Heterochromatin
D. Histone proteins
E. Looped domains
F. Metaphase chromosome
G. Nucleosomes

_____ Small proteins associate with DNA packing

_____ Beads on a string; DNA wound around histone proteins

_____ Tightly would coil with 6 nucleosomes per turn; molecules of one type of histone protein pull the nucleosomes into a cylinder with a diameter of 30 nm

_____ Loops of 30-nm chromatin fibers; each loop contains 20,000 to 100,000 base pairs

_____ Folding of the looped domains

_____ Chromatin that remains highly condensed during interphase; not actively transcribed

_____ Chromatin that is less condensed during interphase; actively transcribed

9. Listed below are the levels of chromatin (DNA) packing in the eukaryotic genome. Put them in the correct order starting with the least condensed.

_____ Looped domains

_____ Nucleosomes

_____ Metaphase chromosome

_____ 30-nm chromatin fiber