WHAT SHOULD I KNOW ABOUT DNA, RNA, & PROTEINS

NAME THE PEOPLE:

_____JAMES WATSON___ & _____RANCIS CRICK_____ used _____Rosalind Franklin's X-ray images to help them figure out the structure of DNA.

SUBUNIT	SUBUNIT NAME	SUBUNIT PICTURE
PROTEINS	AMINO ACID	HHO H-N-C-C-OH R
NUCLEIC ACIDS (DNA & RNA)	NUCLEOTIDE	NTROGEN BASE

	DNA	RNA
Double stranded? Or	DOUBLE	SINGLE
Single stranded?		
Nitrogen bases it contains	A, T, G, C	A, U, G, C
Nitrogen base missing	No U	No T
Sugar it contains?	DEOXYRIBOSE	RIBOSE
Function?	Genetic code molecule	Carry info from DNA to cell and Protein synthesis
Where found in eukaryotic cells?	In nucleus	Made in nucleus; used in cytoplasm

Name the 3 parts of a nucleotide molecule:



What is a purine? <u>NITROGEN BASE WITH 2 RINGS</u> What is a pyrimidine? <u>NITROGEN BASE WITH ONE RING</u>

What is the shape of a DNA molecule? <u>DOUBLE HELIX=</u> "TWISTED LADDER" Which molecules for the backbone of the DNA molecule? <u>PHOSPHATES</u> & <u>SUGARS</u> What molecules form the "steps of the ladder"? <u>NITROGEN BASES</u> What kind of bond holds the nitrogen bases together in the middle? <u>HYDROGEN BONDS</u> What does it mean when we say a DNA strand is "anti-parallel"? TWO DNA STRANDS RUN IN OPPOSITE DIRECTIONS

Chargaff's rule says: A always = _T_; G always = _C__

What are histones? PROTEINS DNA WRAPS AROUND TO PACK TIGHTLY INTO CHROMOSOMES

What is a nucleosome?

BEADLIKE STRUCTURE FORMED WHEN DNA WRAPS AROUND HISTONES

	CHROMATIN	CHROMOSOMES
Tightly packed? OR loosely packed?	LOOSELY PACKED	TIGHTLY PACKED
In dividing? OR non-dividing cells?	IN NON-DIVIDING CELLS	IN DIVIDING CELLS
Easy to read & copy? OR	EASY TO READ & COPY	EASY TO MOVE
Easy to move?		

What is the difference?

	REPLICATION	TRANSCRIPTION	TRANSLATION
WHAT HAPPENS?	$DNA \rightarrow DNA$	$DNA \rightarrow RNA$	$RNA \rightarrow PROTEIN$
	MAKING A DNA COPY	USING DNA TO MAKE RNA MESSAGE	PROTEIN SYNTHESIS
WHERE IT HAPPENS?	NUCLEUS IN EUKARYOTES	NUCLEUS IN EUKARYOTES	CYTOPLASM

What is the Central Dogma of molecular biology that shows how information is passed in cells?

____DNA_______> ___RNA___________PROTEIN_____

What enzyme adds nucleotide subunits to the strand when DNA is copied? ____DNA POLYMERASE______

What enzyme adds nucleotide subunits when RNA is made from DNA? _____RNA POLYMERASE______

The place on the DNA where RNA POLYMERASE attaches to start transcription = ____**PROMOTER_____**

	Messenger RNA (m-RNA)	Ribosomal RNA (r-RNA)	Transfer RNA (t-RNA)
Job during translation (protein synthesis)	HOLDS INFORMATION TO MAKE PROTEIN	COMBINES WITH PROTEINS TO MAKE RIBOSOMES	ADDS AMINO ACIDS IN CORRECT ORDER TO MAKE POLYPEPTIDE CHAIN
SHAPE?			

Which kind of RNA has a CODON? <u>m-RNA</u>	
Which kind of RNA has an ANTICODON? <u>t-RNA</u>	
What kind of molecules make up ribosomes? PROTEINS & r-RNA	_
Which cell part makes r-RNA?NUCLEOLUS	
Which cell part makes proteins? <u>_RIBOSOMES</u>	

The ribosome makes sure the amino acid is put in the right spot by matching the <u>ANTI-CODON</u> on the t-RNA with the <u>CODON</u> on the m-RNA

After an m-RNA message is transcribed from the DNA it is edited. <u>INTRONS</u> are cut out and <u>EXONS</u> stay in the message that gets sent to the ribosomes.

DNA that doesn't code for proteins is called <u>"JUNK DNA"</u> Give an example: <u>TELOMERES</u> , <u>TRANSPOSONS</u> , <u>OPERATOR</u> , <u>PROMOTER</u> , <u>ENHANCER SITES</u>
Name the woman scientist who discovered transposons? <u>BARBARA McCLINTOCK</u>
What is a transposon (jumping gene)? REGION OF DNA THAT CAN JUMP FROM ONE LOCATION TO ANOTHER WHICH IS THOUGHT TO BE INVOLVED IN INCREASING MUTATIONS IN CELLS
Be able to use an mRNA decoder wheel to determine the amino acid sequence if given an mRNA message.
What is an operon? GROUP OF GENES THAT WORK TOGETHER AND ARE CONTROLLED BY ONE OPERATOR/PROMOTER REGION
Operons are found in PROKARYOTES EUKARYOTES (circle one)
In an operon, what attaches to the promoter site when the gene is turned ON?RNA POLYMERASE
In an operon, what attaches to the operator site when the gene is turned OFF? <u>REPRESSOR</u>
What is a repressor? PROTEIN THAT ATTACHES TO OPERATOR TO TURN GENES OFF
When a repressor protein is attached to the operator, the gene is turned ON $\left({ m OFF} ight)$ (circle one)
What is a TATA box? REGION OF DNA WITH MANY A'S AND T'S THAT HELPS POSITION RNA POLYMERASE
What is an enhancer region? REGION IN FRONT OF EUKARYOTIC GENES WHERE REGULATORY PROTEINS CAN JOIN TO INCREASE TRANSCRIPTION
What is differentiation? PROCESS BY WHICH STEM CELLS CHANGE TO BECOME DIFFERENT KINDS OF CELLS WITH DIFFERENT FUNCTIONS DUE TO TURNING ON/OFF DIFFERENT GENES
What role do hox genes play in differentiation and growth and development of embryos? GENES THAT CONTROL THE GROWTH, DEVELOPMENT, AND LOCATION OF BODY PARTS IN DEVELOPING EMBRYOS
TATA boxes, enhancer regions, and hox genes are found in PROKARYOTES (circle one)
What is differentiation? PROCESS BY WHICH EMBRYONIC STEM CELLS CHANGE TO BECOME DIFFERENT KINDS OF CELLS WITH DIFFERENT FUNCTIONS
What is a mutation? CHANGE IN THE GENETIC CODE

What causes mutations? MISTAKES DURING COPYING DNA, MISTAKES DURING CELL DIVISION, CARCINOGENS LIKE CIGARETTE SMOKE, RADIATION, VIRUSES

How are GENE mutations different from CHROMOSOMAL mutations? GENE MUTATIONS - CHANGE IN A SINGLE GENE CHROMOSOMAL MUTATIONS- CHANGE IN WHOLE CHROMOSOME

What is a frameshift mutation?

MUTATION (ADDITION OR DELETION NOT IN GROUPS OF 3) THAT CAUSES THE READING FRAME TO SHIFT OVER

Why is a frameshift mutation at the beginning of the code more damaging than one at the end? EARLY FRAMESHIFTS CHANGE MORE OF THE CODE SO MORE OF THE PROTEIN IS CHANGED

TYPE OF MUTATION	DESCRIPTION	PICTURE
INVERSION	PIECE OF DNA BREAKS OFF, FLIPS, AND REATTACHES SO THAT IT READS BACKWARDS	
DUPLICATION	EXTRA COPIES OF PART OF A CHROMOSOME ARE MADE (This could also cause a frameshift)	
DELETION	PIECE OF DNA IS REMOVED AND LOST (This could also cause a frameshift)	
TRANSLOCATION	PIECE OF DNA BREAKS OFF AND REATTACHES TO ANOTHER NON-HOMOLOGOUS CHROMOSOME	$ \begin{array}{c c} A & B & C & D & E & F & G & H & 1 \\ \hline 1 \\ \hline 3 & K & L & M & N & O & P & Q & R \\ \hline 0 & Original chromosome \\ \hline A & B & C & D & E & F & G & H & 1 & J & K \\ \hline 2 \\ \hline L & M & N & O & P & Q & R \\ \hline Mutation \\ \end{array} $
SUBSTITUTION	ONE NUCLEOTIDE IN CODE IS REPLACED BY ANOTHER (A REPLACES C)	AFCOGACOT Original chromosome AFAGGACOT Mutation
INSERTION	EXTRA PIECE OF DNA IS ADDED (A ADDED TO SEQUENCE) (This could also cause a frameshift)	ATCREACET Original chromosome ATCAREACET Mutation

DUPLICATIONS, DELETIONS, INSERTIONS CAN ALSO CAUSE FRAMESHIFT MUTATIONS

What is polyploidy? CONDITINO IN WHICH CELLS HAVE MORE THAN TWO SETS OF EACH CHROMOSOME (MOST BODY CELLS ARE DIPLOID (2n) ; POLYPLOIDS ARE 3n, 4n, 8n etc)

Polyploidy in plants makes them _BIGGER AND STRONGER____; polyploidy in humans is __LETHAL____;