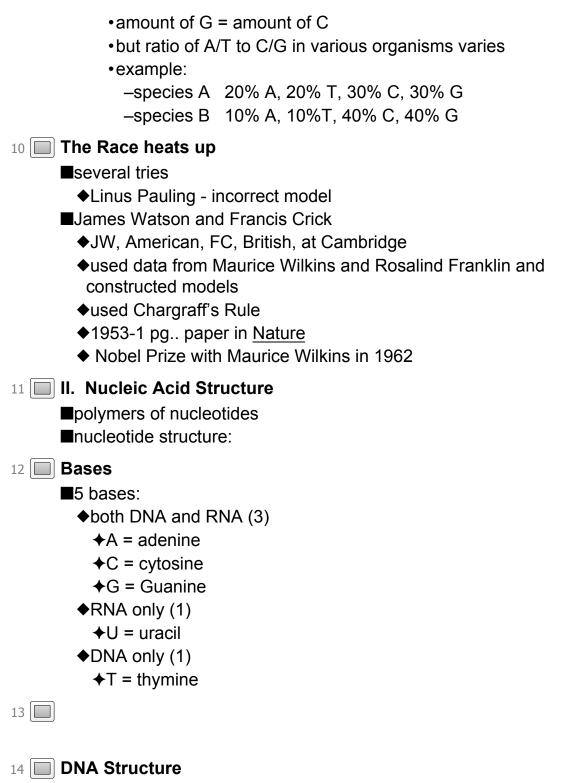
Lecture Notes

NOTE: These notes are only some of the material that is printed on the slides. By providing these notes, it is intended that you will use them to follow along with the lecture, not replace viewing the lecture. If you only look at these notes, you will miss a great deal between material that is not written on the slides and given orally plus the illustrations with their explanations.

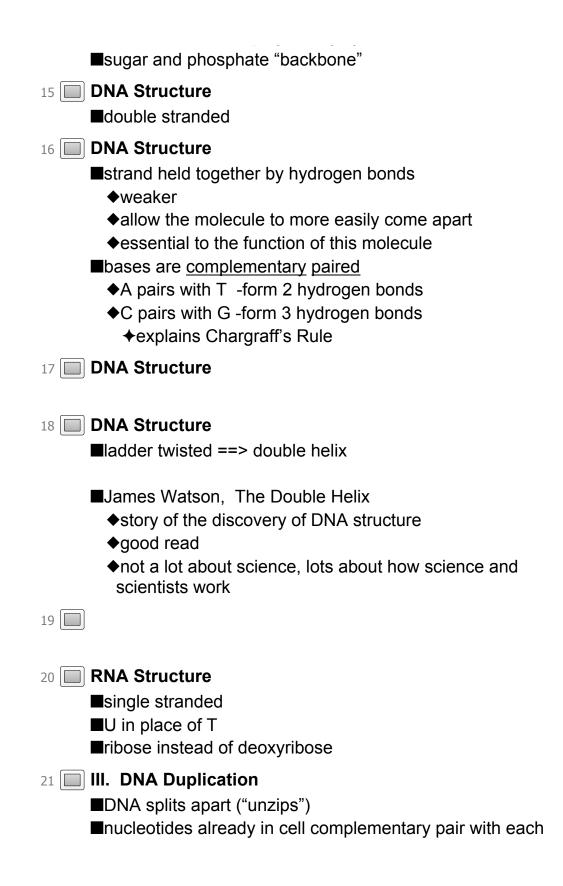
 The Gene Revolution Nucleic Acids: Structure and Function, Control and Manipulation, Science and Technology 2 I. Role of Nucleic Acids Information storage and processing DNA = deoxyribonucleic acid information storage cellular control heredity IRNA = ribonucleic acid information processing uses stored information to control cell 3 Gene Basic information etorage unit
 Information storage and processing DNA = deoxyribonucleic acid information storage cellular control heredity RNA = ribonucleic acid information processing uses stored information to control cell 3 Gene
 DNA = deoxyribonucleic acid information storage cellular control heredity RNA = ribonucleic acid information processing uses stored information to control cell 3 Gene
 ◆uses stored information to control cell 3 Gene
3 Gene
A serie information storage unit
 basic information storage unit segment of DNA types structural gene
◆structural gene ◆controls the synthesis of a specific protein
♦regulatory gene
✦controls other genes
■concept recognized in 1860's but ignored until around 1900
 Historical Development ■early 1900's
 DNA thought to be a binder and stabilizer in the nucleus proteins thought to be the hereditary substance reasons:
 ◆DNA shows less variability in structure than protein •less apparent information content ◆DNA in small amounts in cell
 How could a relatively rare, invariable molecule carry

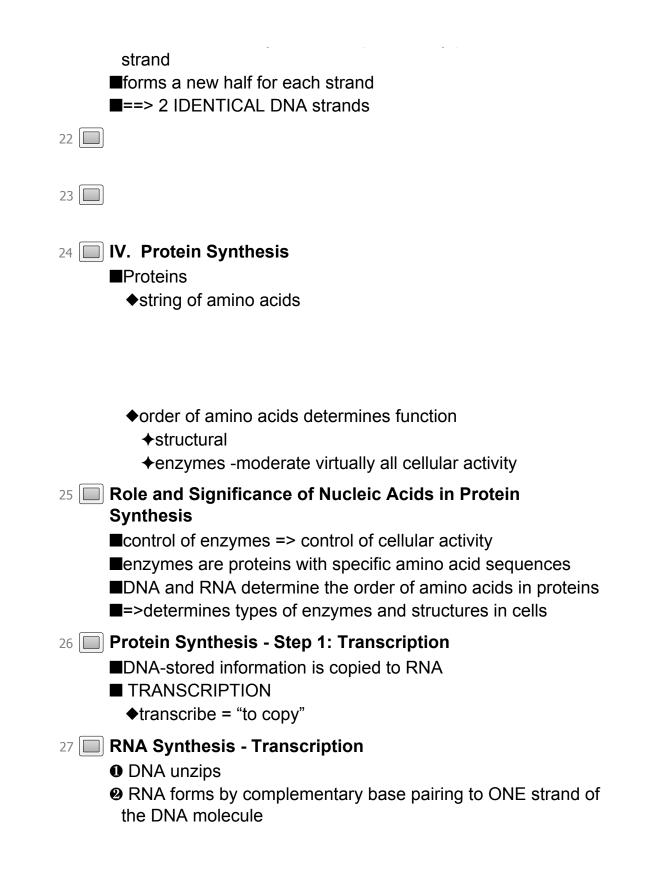
How could a relatively rare, invariable molecule carry complex hereditary information

5 Recognition of DNA's Significance
■critical experiments
■bacteria - 1920's to 1940's
harmless bacteria become pathogenic when mixed with killed pathogenic virus
DNA from pathogens had entered and transformed the harmless bacteria into pathogens
6 Significance, con't
■viruses
Consist of outer coat of protein and inner core of nucleic acid
take over the functions of a cell for viral reproduction
experiments using radioactive protein and radioactive nucleic acids in viruses
7
8 🔲 Significance - con't
■protein did <u>not</u> enter the cell
 protein did <u>not</u> enter the cell radioactivity showed protein in surrounding liquid, not cells How can a hereditary material affect a cell if it does not
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 Improtein did <u>not</u> enter the cell radioactivity showed protein in surrounding liquid, not cells How can a hereditary material affect a cell if it does not enter the cell??? IT CAN'T!!! IDNA <u>did</u> enter the cell radioactivity showed nucleic acid in the cells, not the surrounding liquid Therefore, DNA is the hereditary molecule! 9 Race for discovery of DNA structure several tries knew: deoxyribose sugar and phosphate nitrogen bases of 4 kind

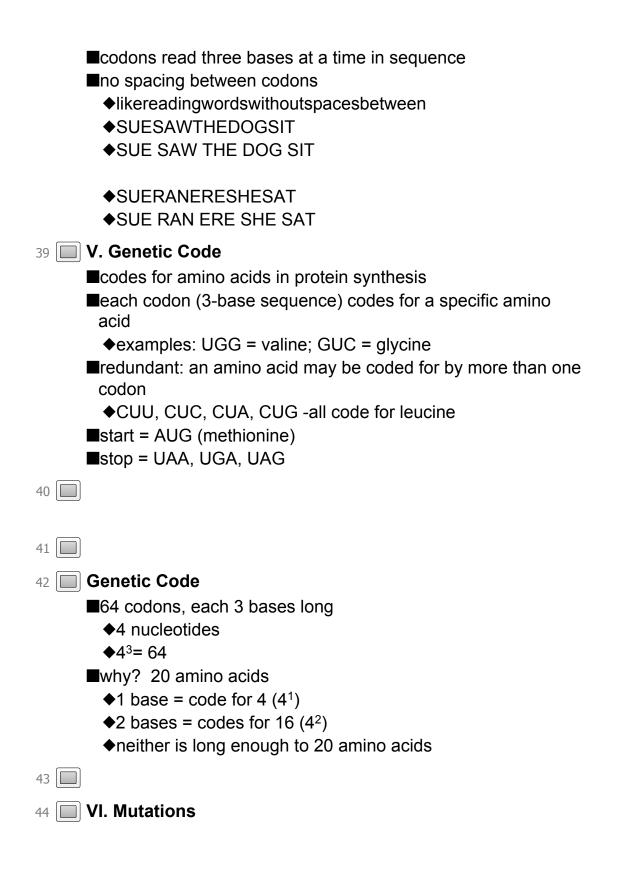


Inucleotides form a polymer by synthesis





 BRNA becomes free of DNA DNA re-zips RNA travels to cytoplasm
28
29
30
31
32
 Brotein Synthesis - Step 2 RNA moves into cytoplasm through nuclear pores
 34 ■ Protein Synthesis - Step 3 ■RNA attaches to a ribosome
 35 Protein Synthesis - Step 4: Translation RNA information "read" to form the protein by bringing in appropriate amino acids one by one TRANSLATION translated from "nucleic acid" language to "protein" language
36 Summary of Protein Synthesis
 37 □ ■3 base sequence on RNA (codon) ♦ code for 1 amino acid 38 □ Translation



■a change in DNA base sequence ■base changed => possible change in amino acid sequence in protein product Can change or destroy that protein's function 45 Mutations ■3 outcomes: •no effect ◆CUU -> CUG both leucine, no effect Oharmful - protein function destroyed or altered to detriment of organism cancers caused by mutagens Obeneficial - new or better protein function bacteria able to exploit a new food source 46 **Types of Mutations: Point Mutations** Change in 1 base in DNA sequence examples herbicide resistance in some plants ♦sickle cell anemia 47 Sickle-cell Anemia normal: B - B - B - G - A - A - B - B - B **RNA** glutamine normal hemoglobin -->rounded cells sickle-cell: B - B - B - G - U - A - B - B - B **RNA** valine altered hemoglobin-->sickle-shaped cells - clog vessels => tissue destruction -resistance to malaria 48 **Types of Mutations: Frameshift Mutation**

■delete one or more bases

Changes 3-base reading frame for synthesis

■SUE SAW THE DOG SIT

- ■UES AWT HED OGS IT_
 - often nonsense
 - may evolve into a useful gene

49 🔲 Frameshift Mutation

Inucleic acid sequence:
U - G - U - A - C - C - A - A - G - C
cysteine threonine lysine

■remove first U:

- U G U A C C A A G C
 - valine proline serine

★completely different protein due to frameshift - totally alters protein function

50 🔲 VII. The Gene Revolution

- ■Manipulation of DNA and genes
- In the past, selective breeding
- Today, selective breeding and direct manipulation of DNA
 - ◆genetic engineering
 - DNA "fingerprinting"

51 🔲 A. Genetic Engineering

■genetic code universal

- ◆same in all organisms
- human (or other) genes can be transferred to bacteria to make human proteins
 - "recombinant DNA" any interspecies transfer
 - human insulin produced by bacteria for diabetics
 +"humulin"
 - other drugs and products

52 Methods of Genetic Engineering

