

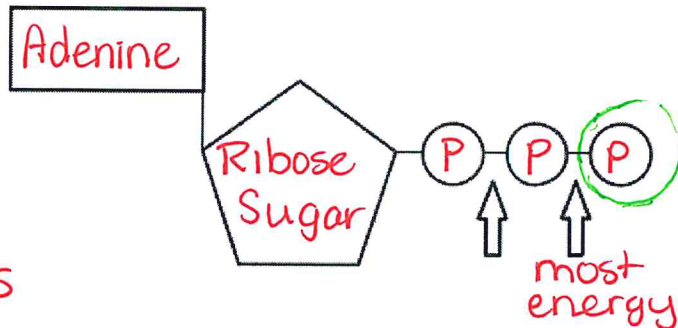
SPRING BENCHMARK 1 BIOLOGY STUDY GUIDE

Semester 1 Topic

Energy : ATP

The molecule to the left is an ATP molecule.

Label and list all three parts:



This is a source of cellular energy.

How do you get the energy out of this molecule?

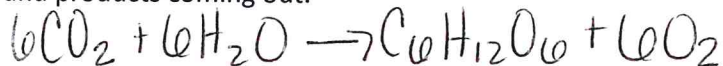
break a bond btwn phosphates

Color the arrow which represents the most energy yellow.

Circle what you would remove to create ADP.

Energy: Photosynthesis

Write out the equation for photosynthesis. Remember reactants are going in and products coming out.



The ultimate source of energy is the SUN.

Which type of organisms ^{do} do photosynthesis? Autotrophs or Heterotrophs

How do the following variables impact the rate of photosynthesis?

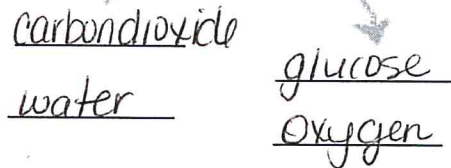
Light Intensity: Increase/Decrease/Stay the Same ✓

Temperature: Increase/Decrease/Stay the Same ✓

Amount of Carbon dioxide Present: Increase/Decrease/Stay the Same ✓



CHLOROPLAST



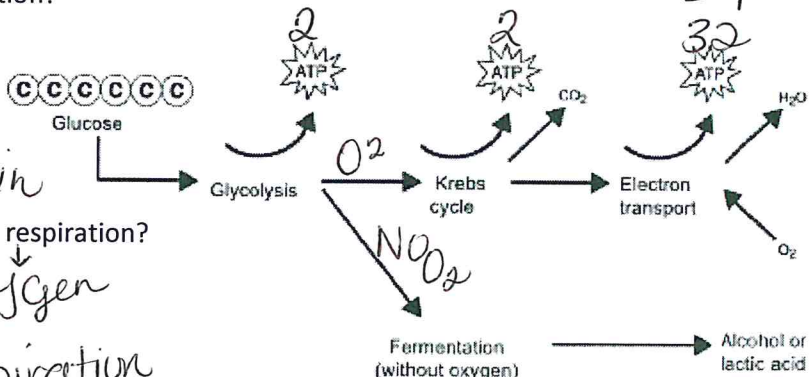
Energy: Cellular Respiration

When you compare the equation for photosynthesis and cellular respiration what do you notice about the process?

they are opposites ex) photosynthesis takes in CO₂ (reactant) cellular respiration releases CO₂ (product)

What are the three parts of aerobic respiration?

- a) glycolysis
- b) krebs cycle
- c) electron transport chain



How is fermentation different from aerobic respiration?

No oxygen Oxygen

What is another name for fermentation?

anaerobic respiration

What are the two type of fermentation? alcoholic and lactic acid

Label the amount of ATP above. How many total ATP for aerobic respiration? 36 anaerobic respiration? 2

Where in the cell does Cellular Respiration occur?

mitochondria

Semester 2 Topics

History

Match each scientist with their contribution to the structure of DNA

- | | |
|-------------------------------|--|
| <u>C</u> 1. Watson and Crick | a. Transformation |
| <u>b</u> 2. Chargaff | b. A = T and C = G |
| <u>e</u> 3. Franklin | c. Identified structure of DNA |
| <u>a</u> 4. Griffin | d. Identified DNA as the inherited material instead of protein. |
| <u>d</u> 5. Hershey and Chase | e. Her photographs were used to help identify the overall structure of DNA |

DNA and RNA

1. Structure:

- a. Where is DNA located in the cell? nucleus
- b. What does the circled section represent? nucleotide
- c. DNA strands run in opposite directions, due to this they are said to be anti-parallel.
- d. What holds the 2 strands together? hydrogen bond

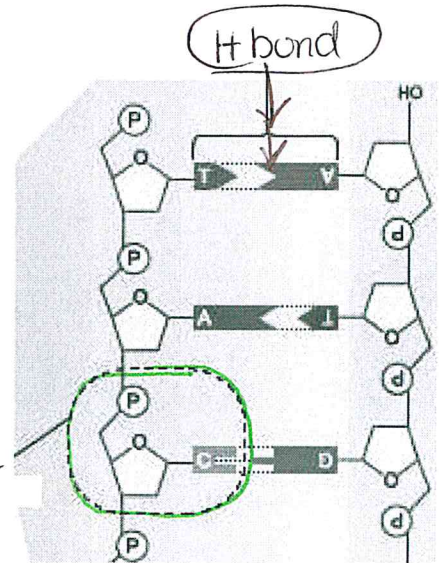
d. What is the monomer of DNA and what are the three parts to the monomer?

Monomer: nucleotide

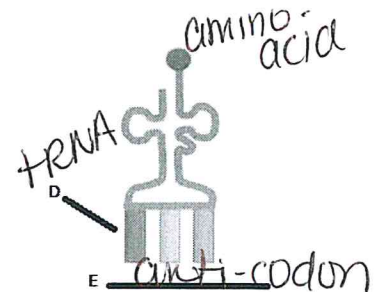
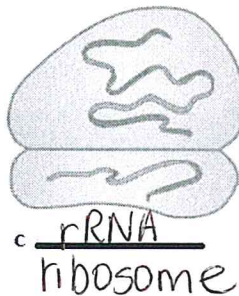
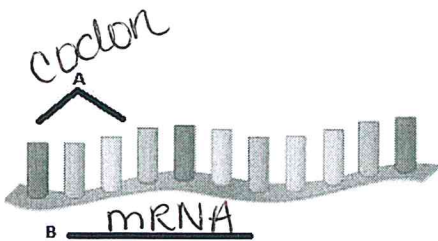
Parts of Monomer: phosphate
deoxyribose sugar
nitrogen base

e. Name three differences between DNA and RNA.

<u>DNA - Thymine</u>	<u>RNA - uracil</u>
<u>double strand</u>	<u>single strand</u>
<u>deoxyribose sugar</u>	<u>ribose sugar</u>



e. Label the different types of RNA and their parts below.



2. DNA Replication:

- a. After DNA replication, the two new strands of DNA are composed of one old strand and one new strand.

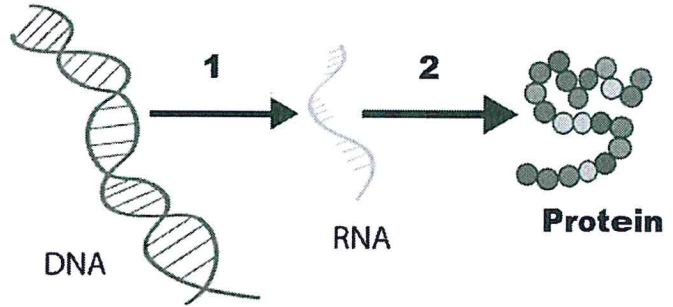
This kind of replication is called Semi-conservative.

- b. What enzyme unwinds and unzips the original DNA strand? helicase

- c. What enzyme brings in the new DNA nucleotides? DNA polymerase
- d. Given a segment of DNA, what complimentary nucleotides would match up during DNA replication?

ATGCTTTACGCGA
TACGAAATGCGCT

3. Protein Synthesis: - Refer to the diagram provided to help you answer the questions that follow

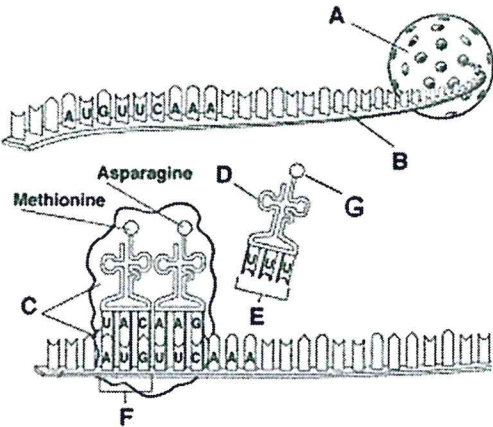


a. What are the two parts of protein synthesis?

1) transcription

2) translation

- b. Where does transcription occur in the cell? nucleus
- c. What is the purpose of transcription? Use a strand of DNA to produce mRNA
- d. Where does translation occur in the cell? ribosome
- e. What is the purpose of translation? Use the strand of mRNA to make a polypeptide chain (protein)
- f. How are a codon and anti-codon different? Codon on mRNA tells amino acid order
- g. What is another name for a protein? polypeptide chain anti-codon brings amino acid
- h. What is the monomer for a protein? amino acid
- i. What type of bond holds these monomers together? peptide bond
- j. Label the image below and explain what is going on.



A: nucleus where DNA is located
 B: mRNA to bring protein instructions to
 C: ribosome (rRNA) where proteins are made
 D: tRNA to bring correct a.a.
 E: anticodon which matches to
 F: codon located on mRNA
 G: amino acids that bond with peptide bonds

k. For the following piece of DNA below, first transcribe it into mRNA, then translate it into a protein. Use the codon chart.

DNA segment: CGA TTA CGG CTT AAG CTA

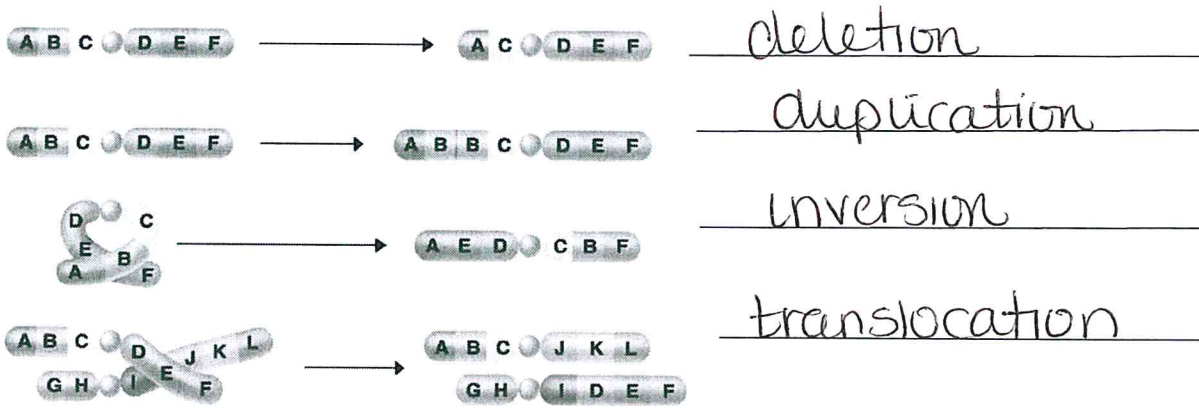
mRNA segment: GCU-AAU-GCC-~~AAA~~-UUC-GAU
 GAA

Polypeptide chain: Ala-Asp-Ala-Glu-pheny-Asp. Acid

	U	C	A	G	U	C	A	U	C	G	U	C	A	U	C
	C	G	U	C	A	G	U	C	A	U	C	G	U	C	A
	A	G	A	C	U	C	A	G	U	C	A	G	U	C	A
	G	A	C	U	G	A	C	U	G	A	C	U	G	A	C
Ala	Val	Arg	Ser	Lys	Asp	Thr	Meth	Iso	Pro	Leu	Cys	Tyr	Stop	Trp	Leu
Asp	Ala	Val	Glu	Asn	Met	Leu	Arg	His	Pro	Leu	Stop	Stop	Trp	Leu	Leu
Asp	Ala	Val	Glu	Asn	Met	Leu	Arg	His	Pro	Leu	Cys	Tyr	Stop	Trp	Leu
Asp	Ala	Val	Glu	Asn	Met	Leu	Arg	His	Pro	Leu	Cys	Tyr	Stop	Trp	Leu

Mutations and Biotechnology

1. What is a mutation? change in DNA
2. Mutations are commonly identified as negative events, however mutations are the original and ultimate source of variation.
3. There are two categories of mutations: 1. Chromosomal 2. gene
4. How do mutations in somatic cells impact an organism differently from a mutation in a gamete?
will not impact offspring will impact offspring
5. What are the four types of chromosomal mutations? Label them in the spaces below.



6. How is polyploidy different from other chromosomal mutations? Caused by nondisjunction
Can impact all chromosomes, great for plants

7. Of the types of gene mutations, how is a substitution mutation different from an insertion or deletion mutation?
substitution ~~can~~ changes only 1 a.a., insertion/deletion are frameshift and impact numerous a.a.

Identify each in the image to the right:

Normal DNA	TAT CAT CCT AAG GTA
Protein	Tyr His Pro Lys Val
Mutation A <i>Substitution</i>	TAT CAT <u>CGT</u> AAG GTA
	Tyr His Arg Lys Val
Mutation B <i>insertion</i>	TAT CAT <u>CGC TAA</u> GGT A
	Tyr His Arg Stop Gly
Mutation C <i>deletion</i>	TAT <u>C TC</u> CTA AGG TA
	Tyr Leu Leu Arg ...

8. What is a silent mutation and how can you tell if a mutation is silent?
silent changes nucleotide, but not a.a. so protein stays the same

9. What is genetic engineering? *purposeful changes in DNA*

10. Match the following terms below:

- | | |
|-------------------------------|---|
| <u>c</u> Cloning | a. a technique used to separate DNA fragments based on their size |
| <u>d</u> Selective Breeding | b. a process which replaces non-functioning genes with genes that function |
| <u>b</u> Gene Therapy | c. to make a genetically identical copy using a somatic cell's DNA |
| <u>a</u> Gel Electrophoresis | d. method of breeding that allows only individuals with desired traits to reproduce |
| <u>f</u> Genetically Modified | e. segment of DNA that codes for a particular trait |
| <u>e</u> Gene | f. Organisms, commonly food, who's DNA has been altered to contain the desired trait. |

11. Read the following gel:

Sample A is the mother

Sample B is the child.

Who is the father?

