

# ECOTOXICOLOGIA

## AULA PRÁTICA 5

random][plasmid

Chromosomes and plasmids are both DNA molecules, but plasmids are smaller, circular, and replicate independently of the bacterial chromosome. Plasmids can be transferred between cells and often carry genes that confer advantages to the host cell, such as antibiotic resistance or the ability to degrade toxic substances.

Chemically, DNA consists of two complementary strands of nucleotides held together by hydrogen bonds. Each nucleotide is composed of a phosphate group, a deoxyribose sugar, and a nitrogenous base. The bases are adenine, thymine, cytosine, and guanine. Adenine pairs with thymine, and cytosine pairs with guanine.

Within cells, DNA is organized into highly condensed structures called chromosomes. These structures are composed of DNA molecules wrapped around proteins called histones. The resulting DNA-protein complex is called chromatin.

The DNA double helix is a right-handed spiral. The two strands are antiparallel, meaning they run in opposite directions. The sugar-phosphate backbone is on the outside, and the nitrogenous bases are on the inside, forming the rungs of the ladder.

Each strand is composed of nucleotides. A nucleotide consists of a phosphate group, a deoxyribose sugar, and a nitrogenous base. The phosphate groups are linked together by phosphodiester bonds, forming the backbone.

The nitrogenous bases are adenine, thymine, cytosine, and guanine. Adenine and thymine are pyrimidines, while cytosine and guanine are purines. Adenine pairs with thymine, and cytosine pairs with guanine.

The structure of DNA is crucial for its function as the genetic material. The double helix allows for the storage and transmission of genetic information. The sequence of bases along a strand determines the sequence of amino acids in a protein.

Replication of DNA occurs during cell division. The two strands of the parent molecule separate, and each strand serves as a template for the synthesis of a new complementary strand. This process is called semi-conservative replication.

Mutations are changes in the DNA sequence. They can be caused by errors during replication or by external factors such as radiation and chemicals. Mutations can have various effects on an organism, from no effect to severe disease or death.

## PLANEAMENTO DAS AULAS

AULA 1 (02.03) – INÍCIO DOS TESTES DE ECOTOXICOLOGIA

AULA 2 (09.03) – EFEITOS DO BEZAFIBRATO NA GERMINAÇÃO DOS ORGANISMOS TESTE (TAXAS DE INIBIÇÃO E CONSTANTES DE INIBIÇÃO IC50)

AULA 3 (16.03) – MARCADORES BIOFÍSICOS DE TOXICIDADE I

AULA 4 (23.03) – MARCADORES BIOFÍSICOS DE TOXICIDADE II

AULA 5 (06.04) – ANÁLISE ESTATÍSTICA MULTIVARIADA E ÍNDICES FOTOQUÍMICOS  
(TEÓRICO-PRÁTICA)

AULA 5 (13.04) - MARCADORES BIOQUÍMICOS DE TOXICIDADE I – PIGMENTOS VEGETAIS

AULA 6 (20.04) – MARCADORES BIOQUÍMICOS DE TOXICIDADE II – PIGMENTOS VEGETAIS II

AULA 7 (27.04) - MARCADORES BIOQUÍMICOS DE TOXICIDADE III – DANO MEMBRANAR

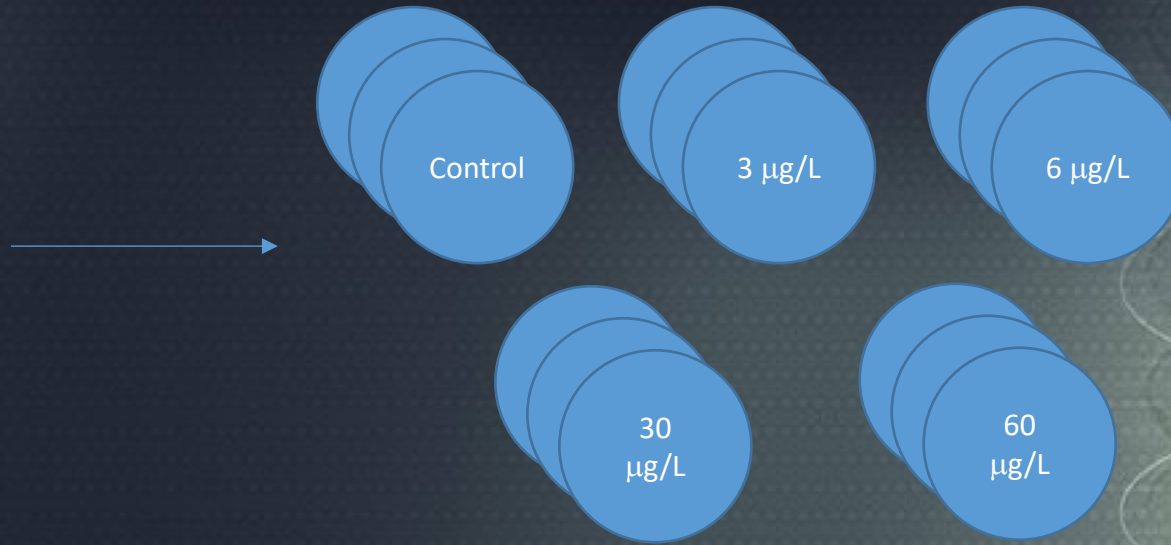
AULA 8 (04.05) – MARCADORES BIOQUÍMICOS DE TOXICIDADE IV

AULA 9 (11.05) - TÉCNICAS DE EXTRAÇÃO E ANÁLISE DE METAIS PESADOS

AULA 10 (18.05) - NANOTOXICOLOGIA

random][pLasatd

DELINEAMENTO EXPERIMENTAL



Chemically, DNA consists of two complementary strands of simple units called nucleotides, which are chains of sugar and phosphate groups. The two strands are joined together and are therefore not free to move independently. These two strands run diagonally opposite to each other and are therefore anti-parallel. Attached to each sugar is one of four types of bases, called nucleobases, in the sequence of these bases lies the information that encodes the instructions for building a protein. This information is passed using the genetic code to RNA through a process of transcription. The primary structure of DNA is the order of the bases in a particular strand. This order is maintained by copying each base of DNA into the complementary base pair, a process called base pairing.

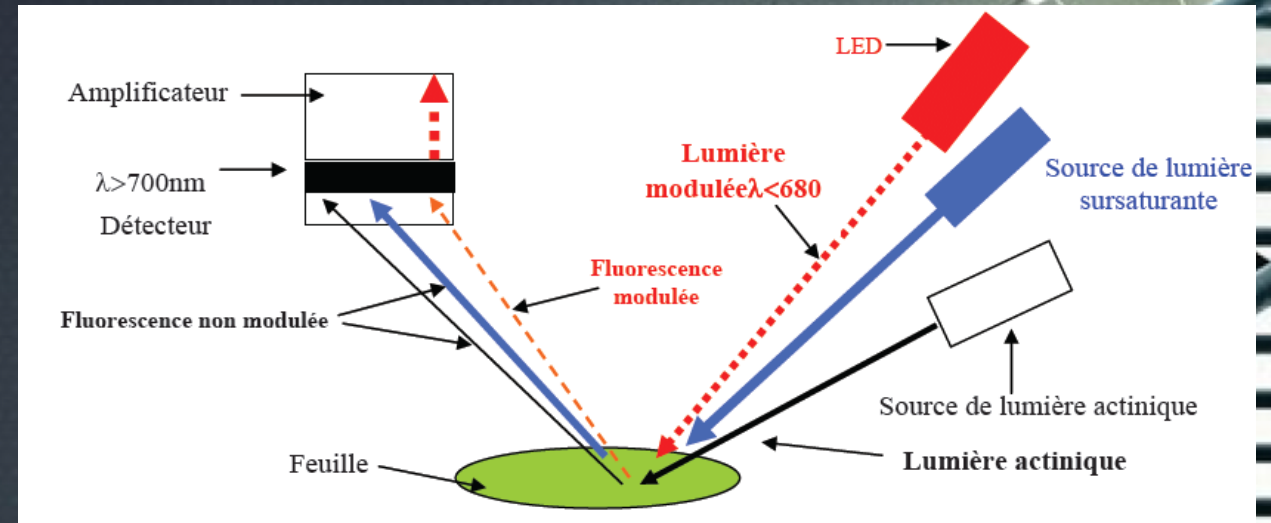
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Within cells, DNA is organized into long structures called chromosomes. These chromosomes are duplicated before cells divide in a process called cell replication. Eukaryotic organisms (animals, plants, fungi, and protists) store most of their DNA inside the cell nucleus and some of their DNA is organized, with mitochondria in chloroplasts. In prokaryotes, which lack a nucleus, DNA is organized into a single circular chromosome. In addition, bacteria have small circular DNA molecules called plasmids.

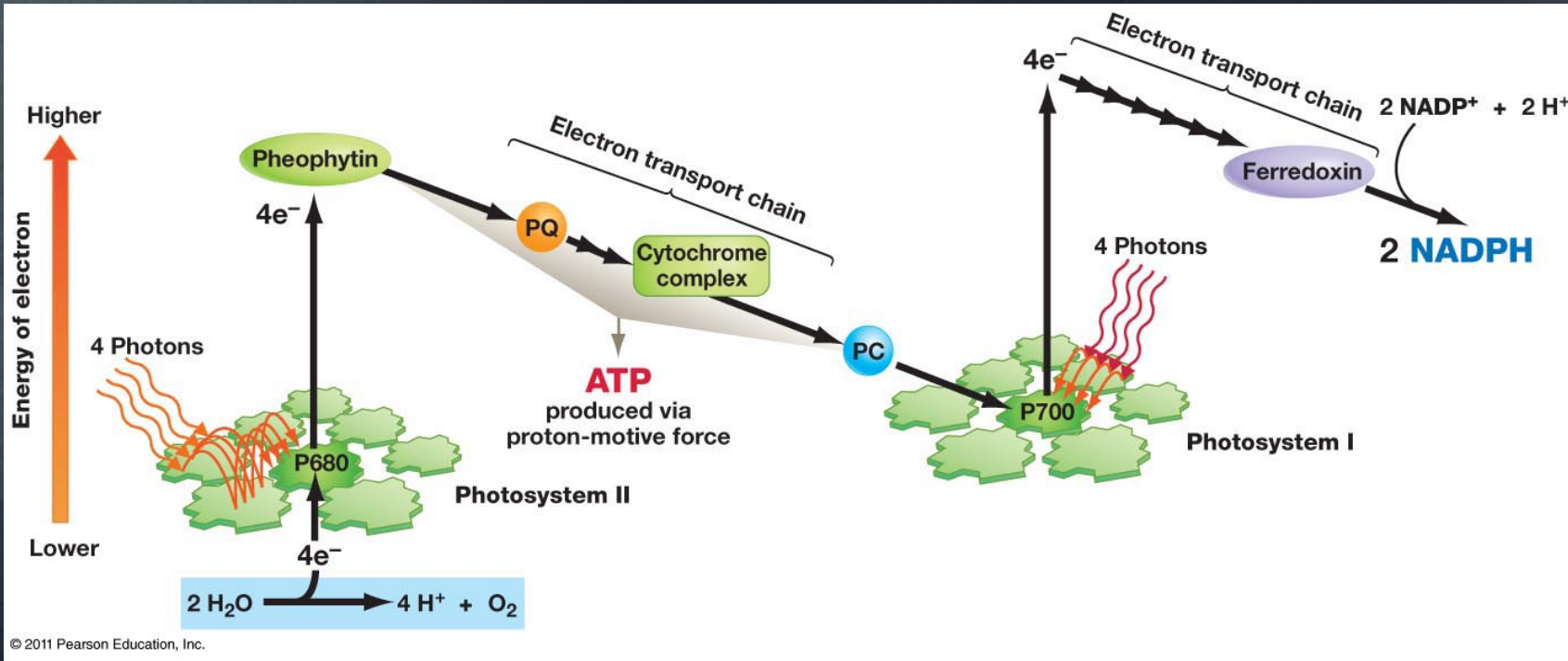


PULSE AMPLITUDE MODULATED (PAM) FLUOROMETRY

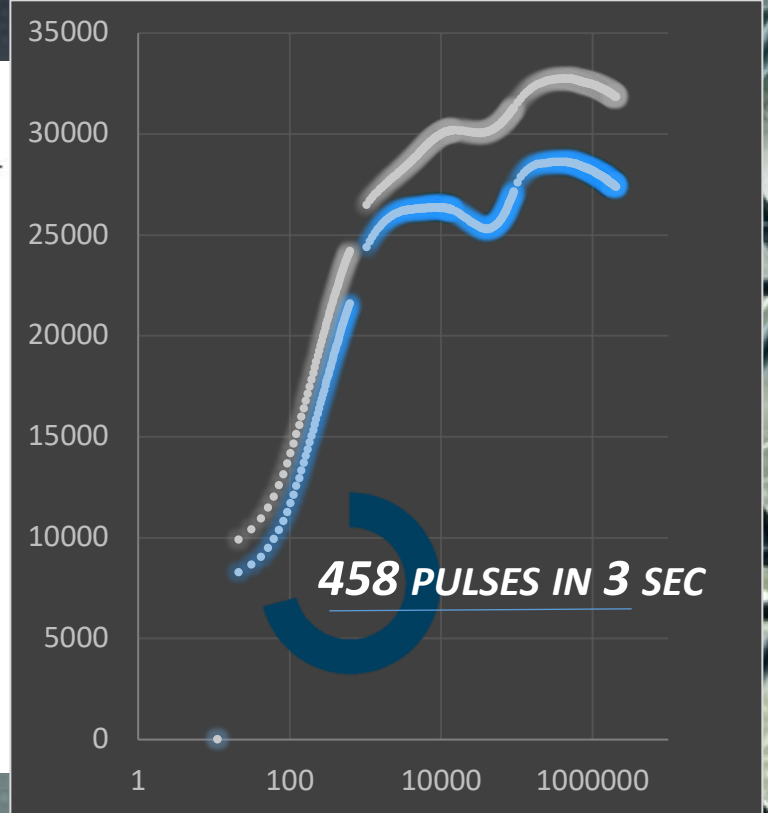


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PULSE AMPLITUDE MODULATED (PAM) FLUOROMETRY



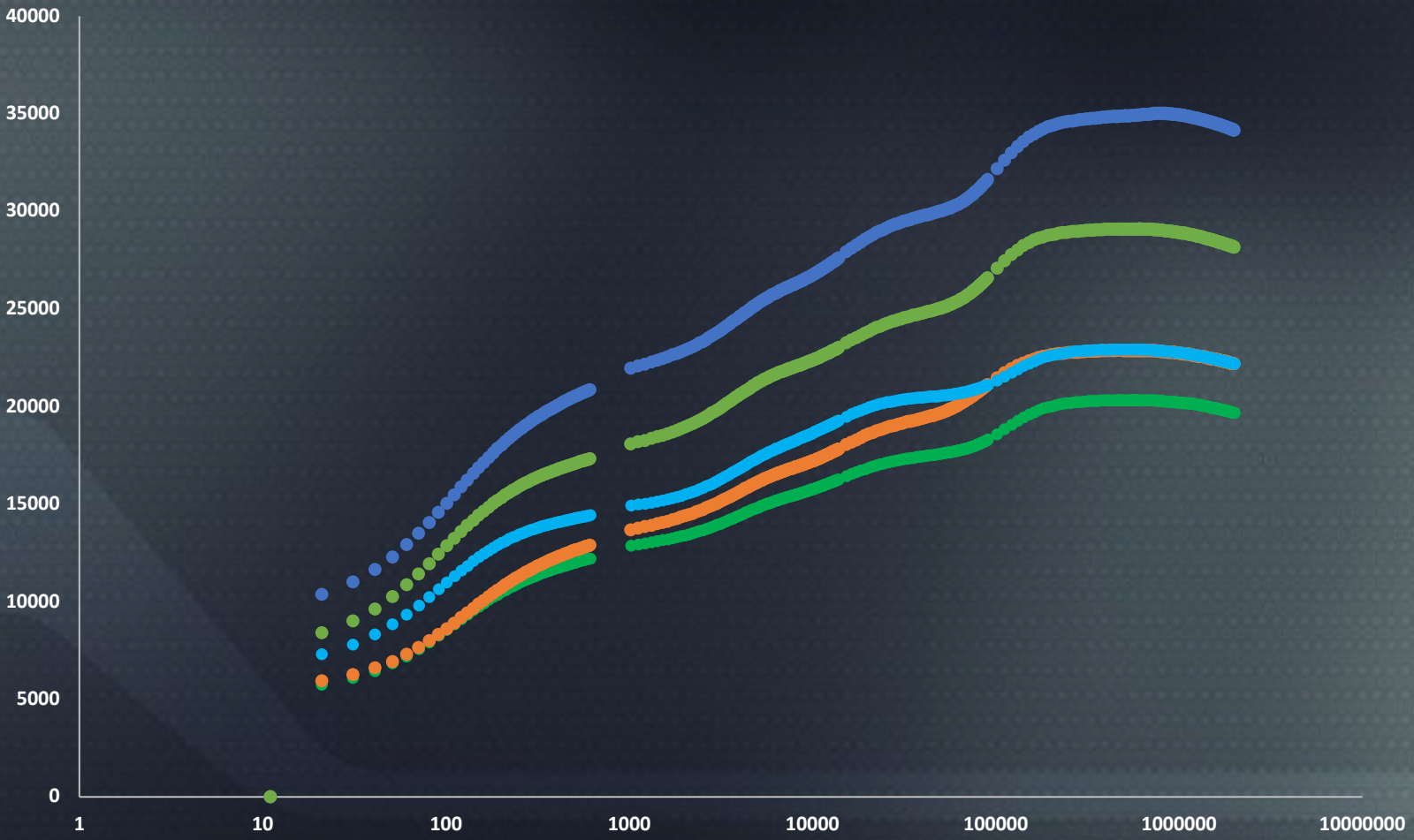
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random][plasatd

The sequence of these base pairs...  
 multiple information...  
 using the genetic code...  
 the protein...  
 copying...  
 a protein called...  
 Water...  
 called...  
 duplicated...  
 implications...  
 fungi...  
 cell...  
 mitochondria...

JIP-TEST



- 0 ug/L
- 3 ug/L
- 6 ug/L
- 30 ug/L
- 60 ug/L

Chromosomes are  
 structures made of DNA  
 molecules. They are  
 the main role of DNA  
 molecules in the long-term  
 storage of genetic  
 information. They are  
 composed of a single  
 molecule of DNA, which  
 is tightly coiled into  
 fibers, which are further  
 coiled into loops. These  
 loops are held together  
 by proteins, and the  
 entire structure is held  
 together by other  
 proteins. The DNA  
 molecules are used for  
 the purpose of storing  
 genetic information.

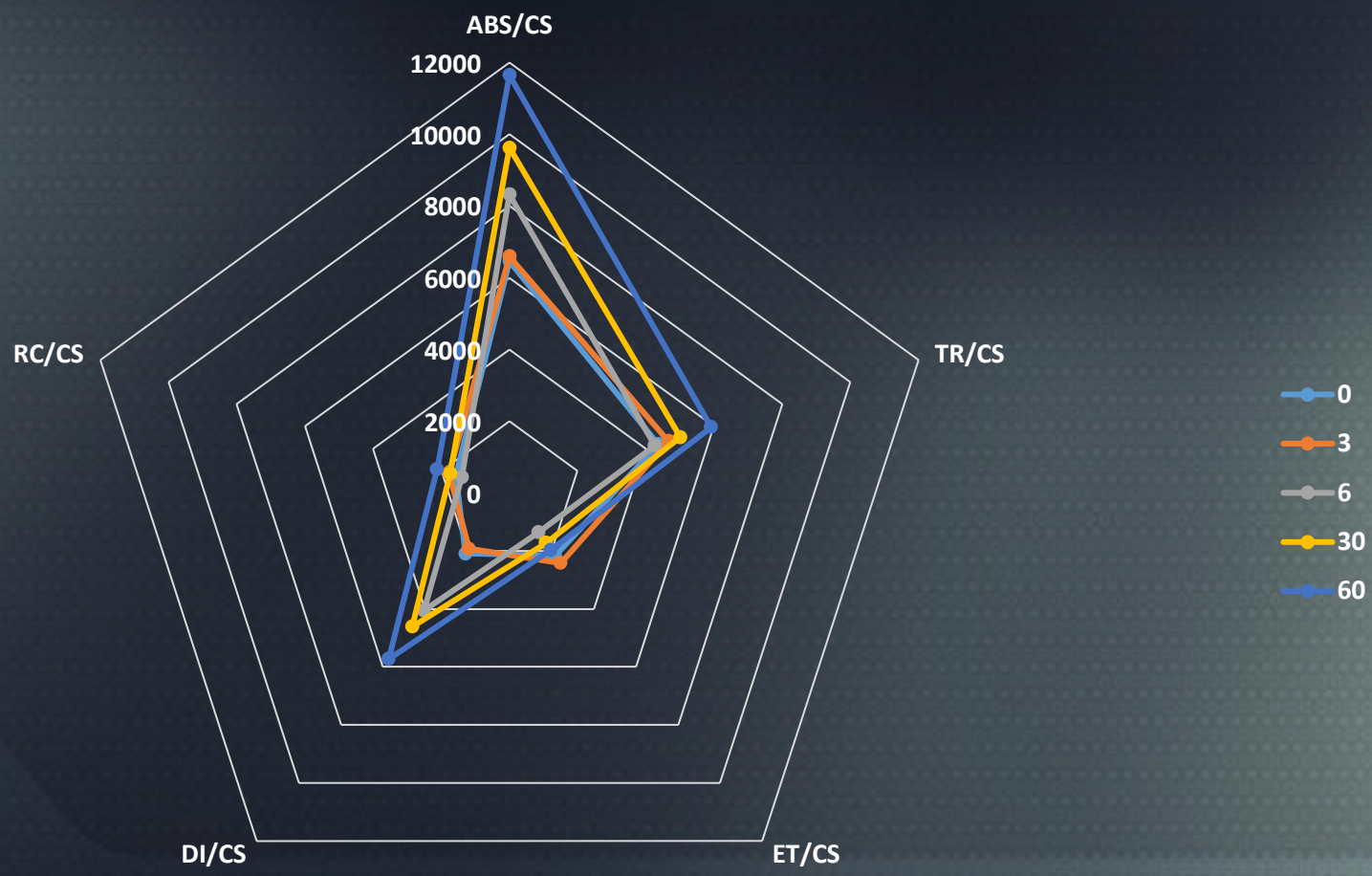
Chemically, DNA consists of two  
 strands of simple units called  
 nucleotides, which are joined  
 together by hydrogen bonds.  
 These two strands run  
 antiparallel to each other  
 and are therefore anti-parallel.  
 The sequence of these two  
 strands is the genetic code,  
 which provides information  
 that controls the development  
 of the organism. This  
 information is passed on  
 from one generation to the  
 next by the process of  
 copying these two strands  
 into a protein called  
 messenger RNA.

Within cells, DNA is organized  
 into long structures called  
 chromosomes. These  
 chromosomes are  
 duplicated before cells divide.  
 In a process called  
 replication, eukaryotic  
 organisms produce several  
 copies of their DNA. Plants,  
 fungi, and protists store most  
 of their DNA inside the  
 cell nucleus and some of  
 their DNA is located in  
 mitochondria or chloroplasts.  
 In prokaryotes, the DNA is  
 located in the cytoplasm.

random][pLasncd



JIP-TEST – ENERGY FLUXES

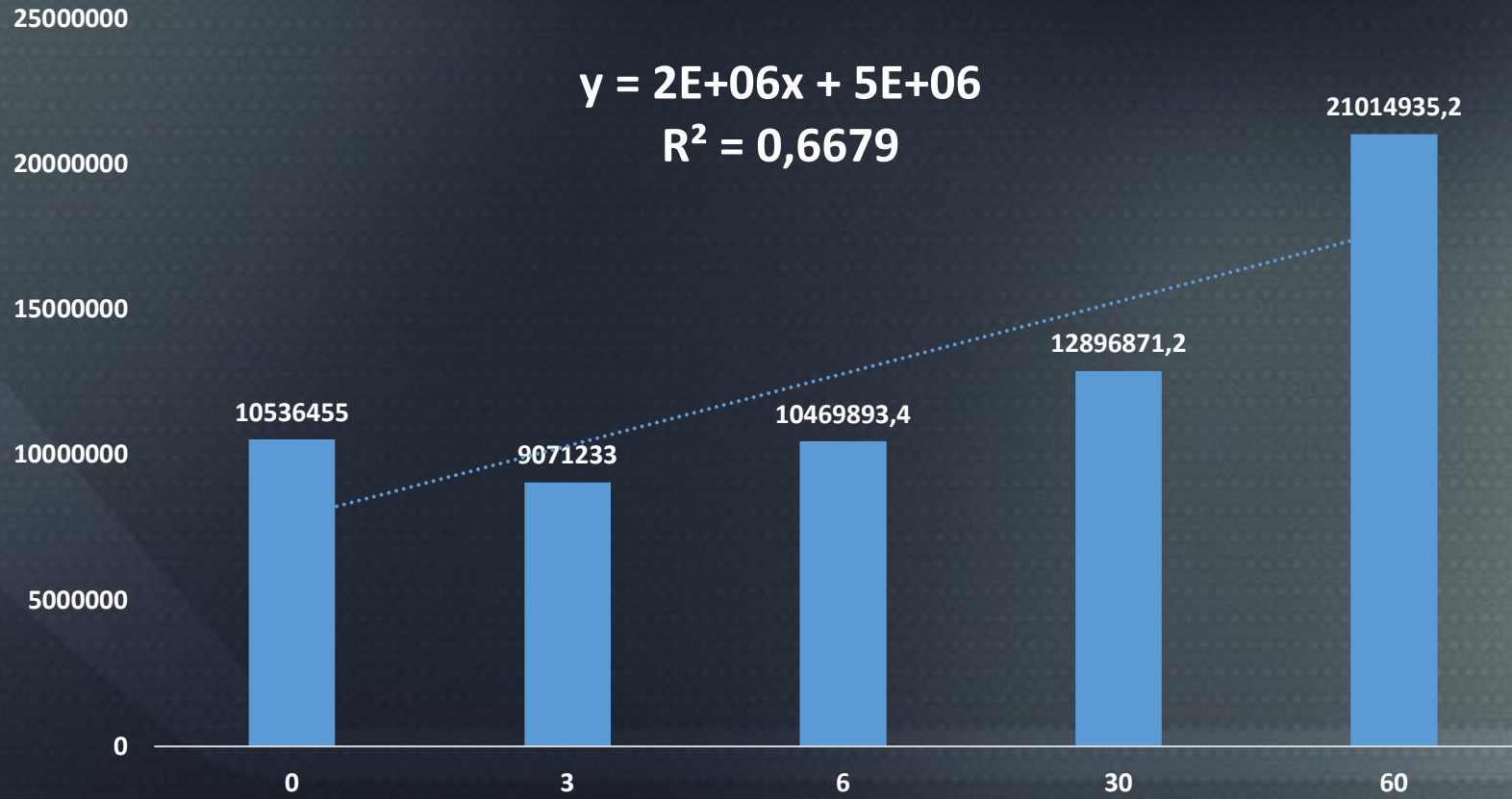


- 0
- 3
- 6
- 30
- 60



JIP-TEST – ELECTRON TRANSPORT CHAIN

Size of the oxidized Quinone Pool (Area)



random][pLasncd

Chemically, DNA consists of long polymers of simple units called nucleotides, which are made of sugar and phosphate groups. These two strands run alongside each other and are therefore not parallel to each other. In the sequence of these two bases, the information that encodes instructions for making proteins is stored. This information is used using the genetic code to build proteins. The process of copying these bits of DNA into the instructions for making a protein is called transcription.

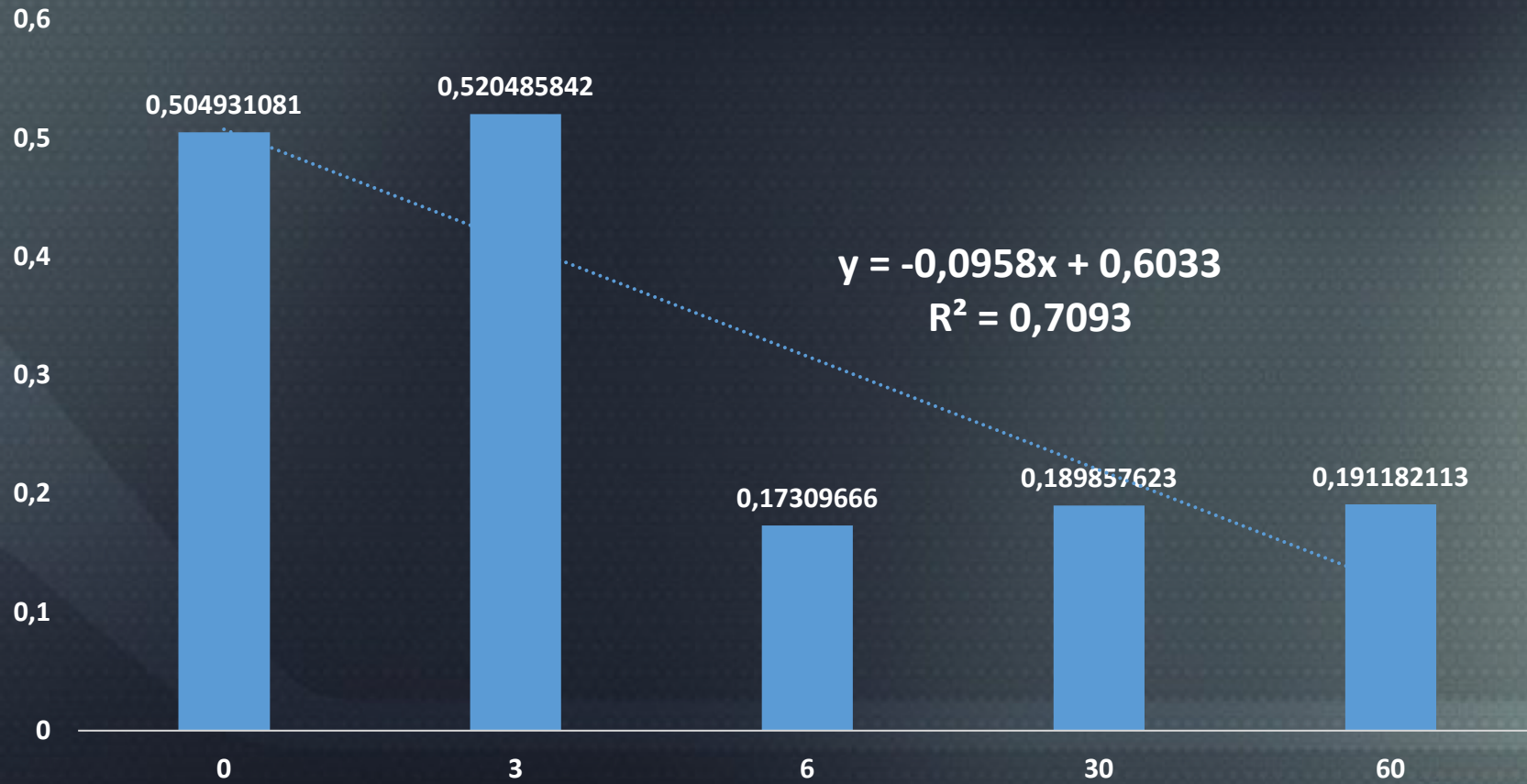
In eukaryotic cells, DNA is organized into long structures called chromosomes. These chromosomes are duplicated before cells divide. In a process called cell replication, eukaryotic organisms produce identical copies of their DNA. In prokaryotes, such as bacteria and some fungi, the DNA is organized into a single circular chromosome. In eukaryotes, the DNA is organized into multiple chromosomes.





JIP-TEST – PSII REACTION CENTRE FUNCTIONING

Reaction Centre Density in the PSII antennae (RC/ABS)



random][pLasatd

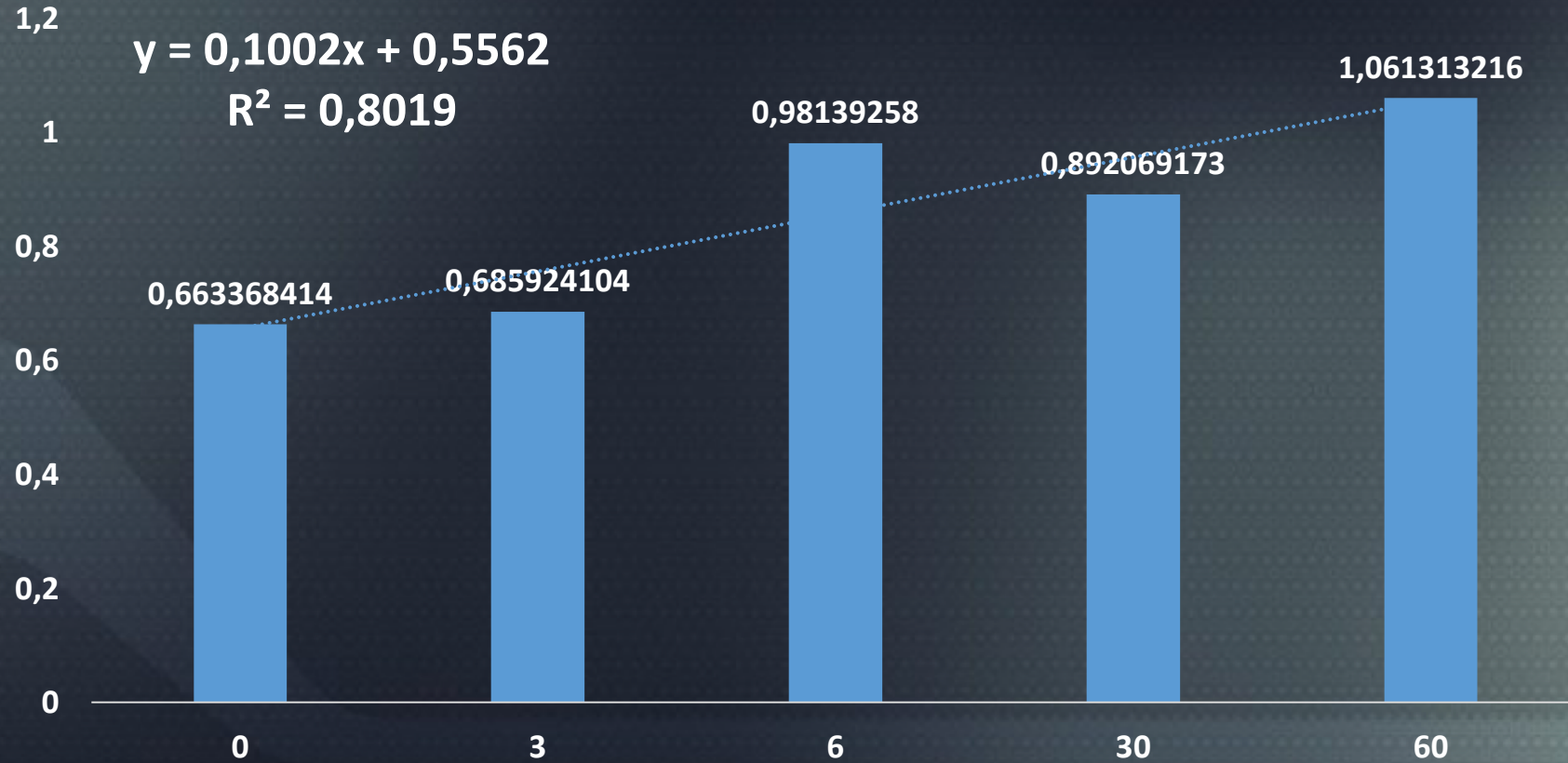
Chemically, DNA consists of long polymers of simple units called nucleotides, which are made of sugar's and phosphate groups. These two strands run diagonally opposite to each other and are therefore anti-parallel. Attached to each sugar is one of four types of nitrogenous bases, in the sequence of these has been used to describe that carries information. This information is coded using the genetic code. Each sequence of bases that codes for a protein is called a gene. The process of copying these bits of DNA into the internal code book is a process called transcription.

In eukaryotic cells, DNA is organized into long molecules called chromosomes. These chromosomes are duplicated before cells divide. In a process called cell replication, eukaryotic organisms produce many copies of their DNA. Most of their DNA is in the cell nucleus and some of their DNA is in organelles, such as mitochondria or chloroplasts. In prokaryotic cells, DNA is organized into a single circular chromosome. In addition, they have small pieces of DNA called plasmids that carry genes which are beneficial to the survival of the organism.



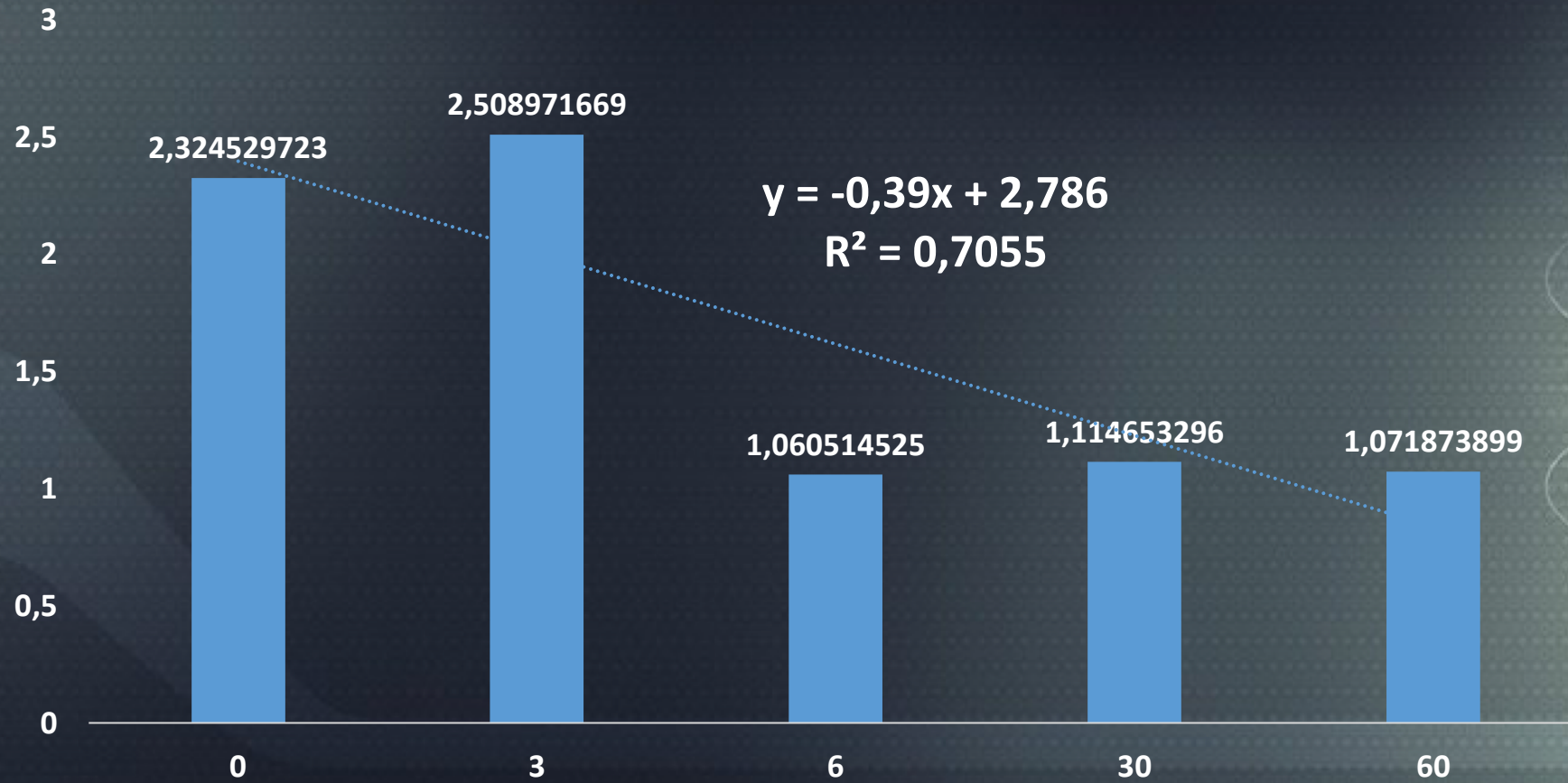
JIP-TEST – PSII REACTION CENTRE FUNCTIONING

PSII Antennae Decoupling (PG)



JIP-TEST – PHOTOCHEMICAL REACTIONS

Contribution of the Light Reactions



random][pLasncd

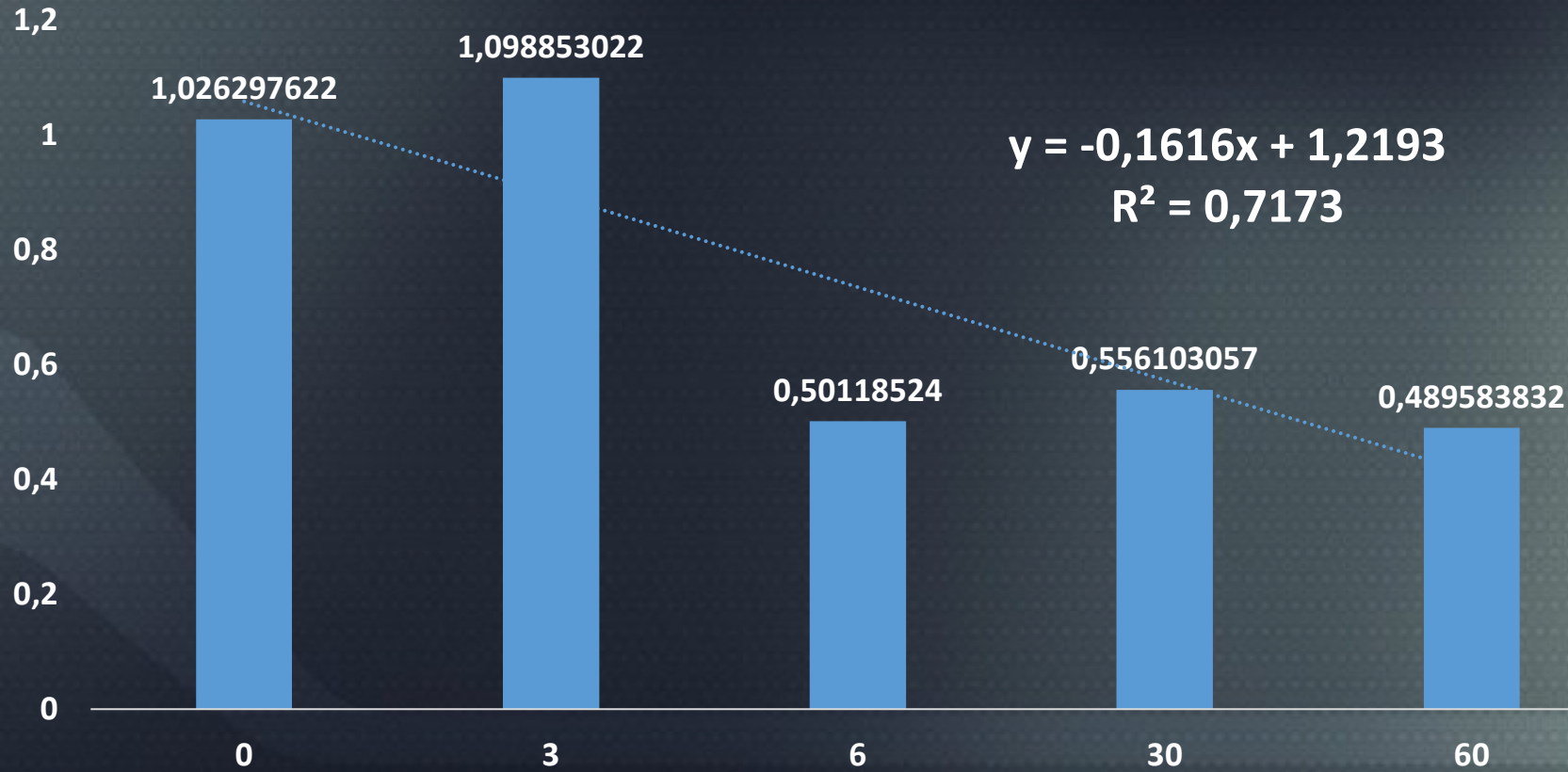
Chemically, DNA consists of two complementary strands of simple units called nucleotides, which are made of sugar and phosphate groups. These two strands run alongside each other and are therefore anti-parallel to each other and are therefore anti-parallel to each other. In the sequence of these two strands, the bases that provide information. This information is used using the genetic code to build proteins. The process of copying this information into a new strand is called DNA replication.

In eukaryotic cells, DNA is organized into long molecules called chromosomes. These chromosomes are duplicated before cell division. In a process called DNA replication, eukaryotic organisms produce many copies of their DNA. In prokaryotes, such as bacteria and some of their DNA is organized into circular molecules called plasmids.



JIP-TEST – PHOTOCHEMICAL REACTIONS

Contribution of the Dark Reactions



random][pLasncd

Chemically, DNA consists of two complementary strands of simple units called nucleotides. Each nucleotide is composed of a phosphate group, a five-carbon sugar, and a nitrogenous base. The phosphate group of one nucleotide is attached to the sugar of another, and the sugar of one nucleotide is attached to the phosphate group of another. The nitrogenous bases are attached to the sugar of one nucleotide and are paired with the nitrogenous base of another nucleotide. The sequence of these bases in the DNA molecule provides the instructions for the synthesis of proteins.

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Within cells, DNA is organized into long molecules called chromosomes. These chromosomes are duplicated before cells divide. In a process called cell replication, eukaryotic organisms produce identical copies of their DNA. Some organisms, such as bacteria and some viruses, do not have a nucleus and some of their DNA is organized into circular molecules called plasmids.



JIP-TEST – MULTIVARIATE ANALYSIS

PRIMER 6 - [Data1]

File Edit Select View Analyse PERMANOVA+ Tools Window Help

Bezafibrate\_PAM

- Bezafibrate Pheodact
  - Normalise1
    - Data1
      - Resemblance1
        - Resem1
          - MDS1
            - Graph1
            - Graph2
          - CAP1
            - Graph3
          - ANOSIM1
            - Graph4
        - SIMPER1
      - FA Bezafibrate Pheodact
        - Resemblance2
          - Resem2
            - MDS2
              - Graph5
              - Graph6
            - CAP2
              - Graph7
            - ANOSIM2
              - Graph8
          - SIMPER2

Other

	Samples									
	0a	0b	0c	3a	3b	3c	6a	6b	6c	30a
Mo	-0,79981	-0,67153	-0,70568	-0,67736	-0,70152	-0,75649	-0,67986	-0,79148	-0,74816	0,5371
Area	-0,74424	-0,62083	-0,73654	-0,69878	0,98016	1,4011	1,4923	-0,6351	2,2718	-0,5541
Fix Area	-1,3268	-7,8111E-2	-1,9103	-1,2763	-0,24289	-0,5025	0,81508	-0,22803	1,595	-0,3651
Sm	-0,79044	-0,75402	-0,66442	-0,69754	1,3506	1,9282	1,3486	-0,75557	1,6617	-0,5361
Ss	1,2551	0,10637	0,36164	0,5531	0,234	0,99984	-8,5093E-2	0,93602	0,80838	4,2546E
N	-0,87471	-0,81356	-0,72857	-0,76607	1,3434	1,8294	1,3877	-0,83412	1,5891	-0,5861
Phi_Po	0,74981	0,72795	0,49842	0,47656	0,57493	0,82632	0,74981	0,76074	0,90283	-0,1571
Psi_o	0,84532	0,74387	0,77227	0,7114	0,77633	0,79662	0,77633	0,8575	0,80068	-1,1511
Phi_Eo	0,86403	0,74825	0,70483	0,6397	0,73378	0,84232	0,79167	0,87851	0,87127	-1,1511
Phi_Do	-0,74981	-0,72795	-0,49842	-0,47656	-0,57493	-0,82632	-0,74981	-0,76074	-0,90283	0,1571
Phi_Pav	-1,8084	-1,4086	-0,98627	-1,1363	0,69253	0,7485	0,84489	-1,321	0,6957	0,4301
Pi_Abs	1,0024	0,66906	0,52273	0,42517	0,58776	0,96985	0,73409	1,0186	1,0511	-1,1111
ABS/CS	-1,154	-0,48005	-1,3929	-1,0316	-0,50807	-0,77203	-4,7975E-2	-0,5936	0,2617	-0,1881
TR/CS	0,38604	0,95852	0,1195	0,41155	0,8784	0,74026	1,1079	0,75649	1,3824	-1,1111
ET/CS	0,7859	1,317	0,42667	0,69302	1,2676	1,1371	0,35009	0,18662	0,58325	-1,1211
DI/CS	-0,93496	-0,73362	-0,97886	-0,8645	-0,71766	-0,83371	-0,5105	-0,72194	-0,42294	0,3681
RC/CS	0,44496	0,9118	0,11125	0,41269	0,84976	0,78491	1,035	0,79803	1,414	-1,1111
PG	0,49165	7,2625E-2	1,0259	0,79491	0,78723	-2,6102E-2	0,16546	0,49623	-0,25956	-2,3411
RE0/RC	1,6785	0,11256	0,26342	-2,7376E-2	0,15693	-0,45269	-0,50669	-0,11621	-1,7566	-1,0811
RC/ABS	1,1216	1,1092	1,0238	1,0932	1,0323	1,1749	-0,10622	-1,3489E-2	-4,9922E-2	-1,0511
TR0/DI0	0,94577	0,92824	0,75329	0,73745	0,80982	1,0084	0,55747	0,70618	0,60079	-1,1611

Variables

Row 1 Col 1

13:34  
06-04-2018



JIP-TEST – MULTIVARIATE ANALYSIS

PRIMER 6 - [Resem1]

File Edit Select View Analyse PERMANOVA+ Tools Window Help

Bezafibrate\_PAM

- Bezafibrate Pheodact
  - Normalise1
    - Data1
      - Resemblance1
        - Resem1
        - SIMPER1
- FA Bezafibrate Pheodact
  - Resemblance2
    - Resem2
      - MDS2
        - Graph5
        - Graph6
      - CAP2
        - Graph7
      - ANOSIM2
        - Graph8
    - SIMPER2

Distance (0 to inf)

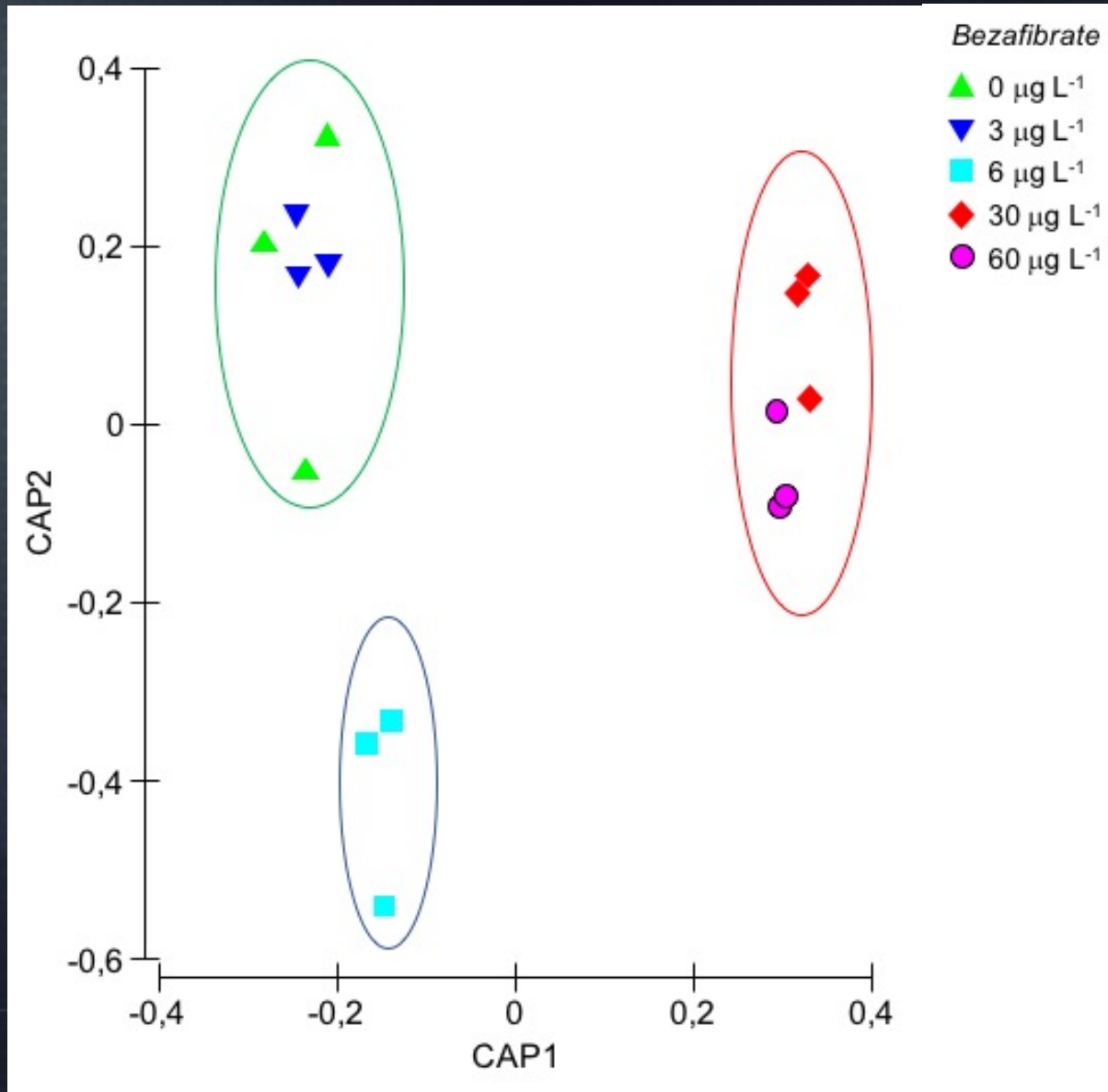
	0a	0b	0c	3a	3b	3c	6a	6b	6c	30a	
0a											
0b		2,7787									
0c		2,3379	2,7901								
3a		2,2815	1,9452	1,0172							
3b		5,0319	4,0889	4,4372	4,14						
3c		5,7205	4,9628	5,2222	4,9606	1,7332					
6a		6,6327	5,2675	5,9871	5,5811	3,1188	3,5311				
6b		3,6154	2,8503	3,3195	2,7947	4,8299	5,5454	4,6587			
6c		7,8449	6,2794	7,3303	6,7854	4,2885	4,0646	2,1451	5,7387		
30a		9,0787	8,2068	8,0515	7,873	8,67	8,9887	7,5675	7,2049	8,3744	
30b		9,6865	8,9229	8,7069	8,6067	9,1812	9,8978	8,201	8,0637	9,3643	3,2425
30c		10,886	10,095	10,016	9,8891	10,14	11,048	9,1764	9,3317	10,334	5,7539
60a		9,2485	8,0945	8,4126	8,1166	8,4881	9,035	7,1297	7,2492	7,9739	2,275
60b		10,938	10,222	10,151	10,034	10,005	10,957	9,076	9,4831	10,285	6,5093
60c		9,6669	8,7104	8,6277	8,3606	8,7721	9,3252	7,5875	7,5693	8,2802	3,3399

Row 1 Col 1

13:39  
06-04-2018



JIP-TEST – MULTIVARIATE ANALYSIS



random][pLasatd

Chemically, DNA consists of two complementary strands of simple units called nucleotides, which are made of sugar and phosphate groups. The two strands are joined together by hydrogen bonds between the bases. There are four types of bases: adenine, thymine, guanine and cytosine. Adenine pairs with thymine and guanine pairs with cytosine. The sequence of these bases in the DNA molecule provides the instructions needed to synthesize proteins and other molecules. This information is passed on to the next generation through the process of reproduction.

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