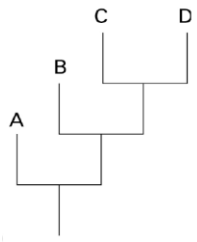


A: Orangotango
B: Gorila
C: Seres Humanos
D: Chimpanzé

Grupo	Sequência de DNA
Seres Humanos	CTTAAC**A**CCC**C**TGACTT**C**GCGCCGT**C**G
Gorila	CTTAAC**G**CCC**C**TGACTT**A**GCGCCGT**C**G
Orangotango	CTTAAC**C**CCC**A**TGACTT**G**GCGCCGT**T**G
Chimpanzé	CTTAAC**T**CCC**C**TGACTT**C**GCGCCGT**C**G

1

Universidade de São Paulo
Escola de Engenharia de Lorena
Departamento de Biotecnologia

Curso: Engenharia Ambiental

Biomoléculas

Prof: Tatiane da Franca Silva
tatianedafranca@usp.br

2

Química da Célula

❖ Principais átomos : H, C, O e N

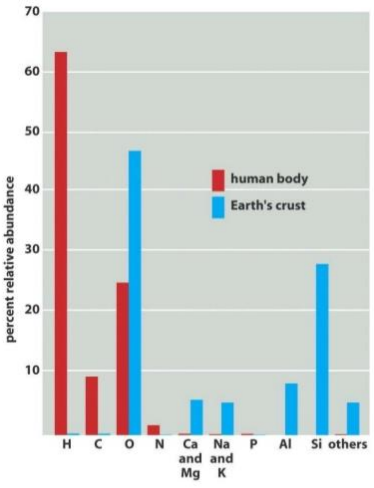
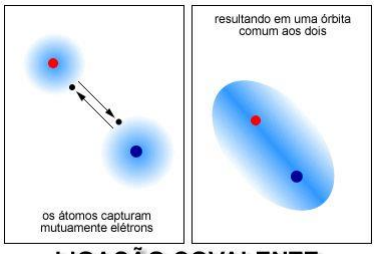


Figure 2-3 *Molecular Biology of the Cell* (© Garland Science 2008)

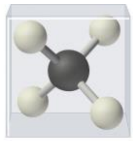
❖Moléculas



LIGAÇÃO COVALENTE

Single bond

Double bond



Tetrahedral structure of methane, CH_4

Triple bond

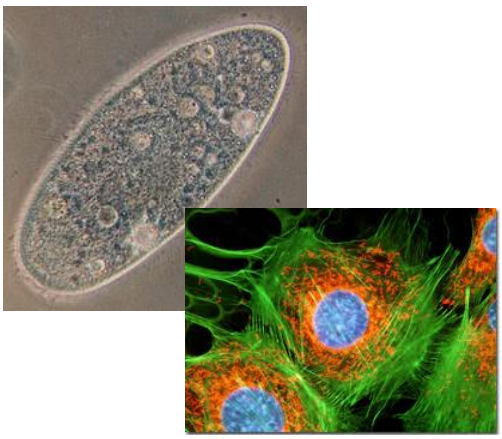
3

Química da Célula

❖ As combinações de átomos mais frequentes: grupo Metil (-CH3), Hidroxil (-OH), Carboxil (-COOH) e Amino (-NH2)

❖ **Moléculas orgânicas**:

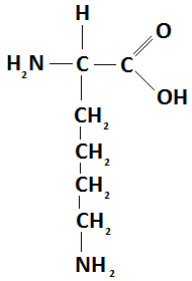
- ❑ Carboidratos
- ❑ Lipídeos
- ❑ Aminoácidos
- ❑ Nucleotídeos



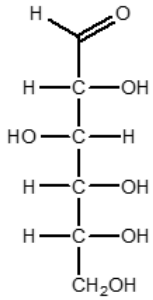
4

Moléculas Orgânicas

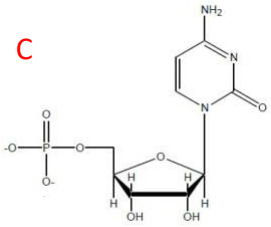
A



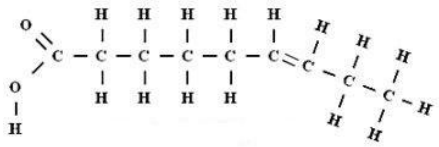
B



C

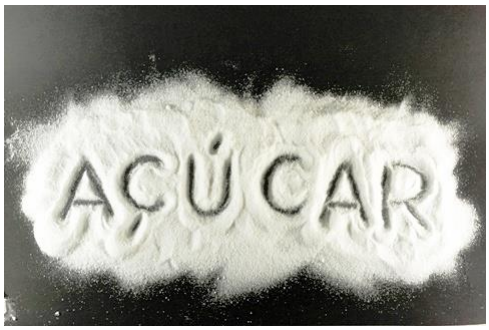


D



5

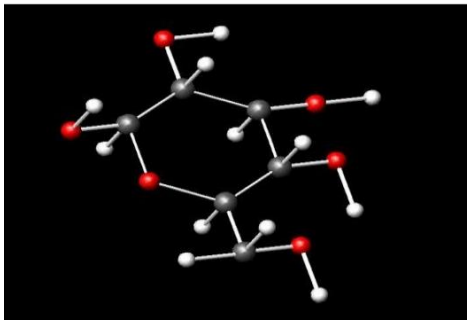
Carboidratos

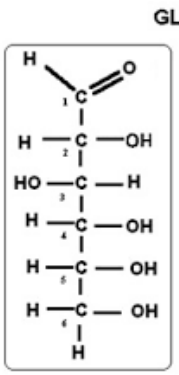


6

Carboidratos

- "Carbono hidratado" **$C(H_2O)$**



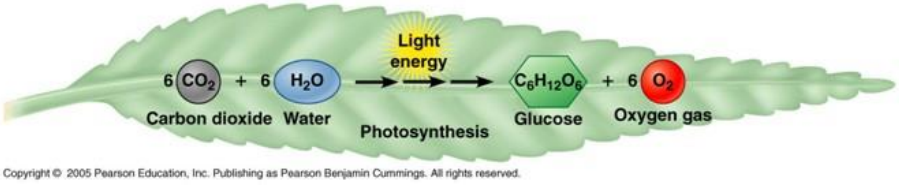


$C_6H_{12}O_6$

7

Carboidratos

- Produzidos na Fotossíntese



8

Carboidratos

❖ Funções na Célula:

✓ Fonte de energia

✓ Estrutural

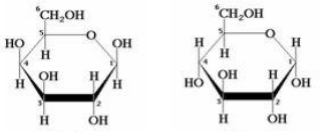
✓ Reserva Energética

✓Oxidação : Libera Energia, CO_2 e H_2O

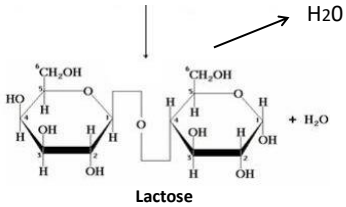
9

Classificação – número de monômeros

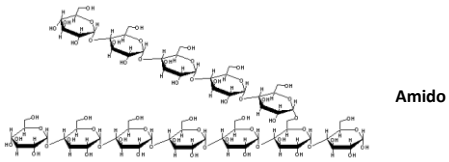
❑ **Monossacarídeo**



❑ **Dissacarídeo**



❑ **Polissacarídeo**



10

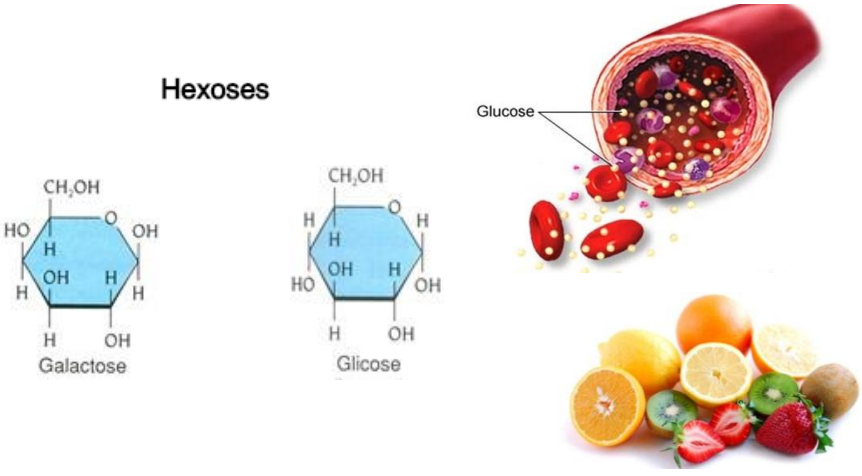
Monossacarídeo

- ❖ Solúveis em água
- ❖ Nome é dado pelo número de carbonos mais a terminação "ose"

Prefixo (número de carbonos)	Sufixo (ose)	Fórmula geral
3	Triose	$C_3H_6O_3$
4	Tetrose	$C_4H_8O_4$
5	Pentose	$C_5H_{10}O_5$
6	Hexose	$C_6H_{12}O_6$
7	Heptose	$C_7H_{14}O_7$

11

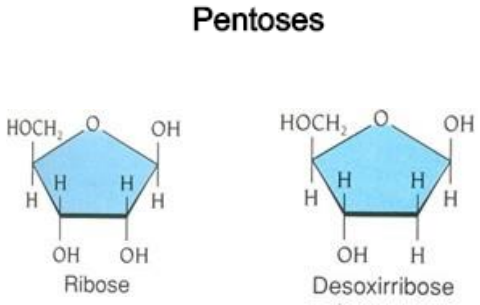
Monossacarídeo



- ❖ **Função: Aproveitados diretamente como Fonte de Energia**

12

Monossacarídeo

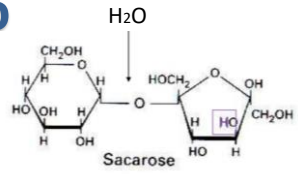


❖ **Função: Estrutural, participam da constituição dos ácidos nucleicos**

13

Dissacarídeo

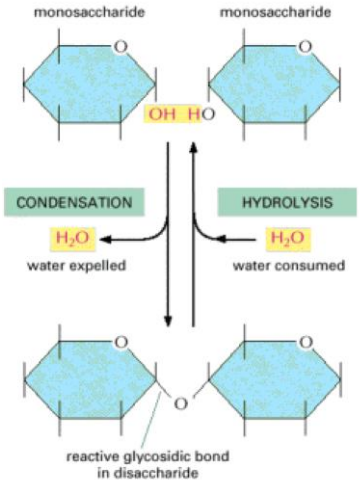
❖ Solúveis em água



Carboidrato	Monossacarídeo constituinte
Sacarose	glicose + frutose
Lactose	glicose + galactose
Maltose	glicose + glicose

❖ **Função: Fonte de Energia a Médio Prazo.**

14



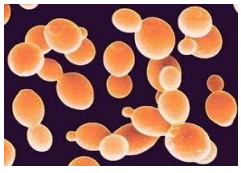
15

Importância econômica – Sacarose

❖ **Indústria Alimentícia**

Açúcar

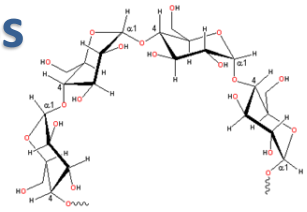
❖ **Produção de Etanol**



S. cerevisae

16

Polissacarídeos



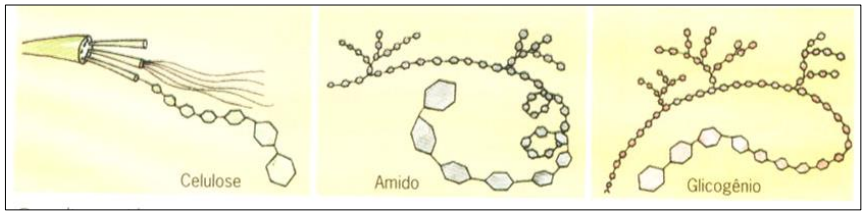
- São Polímeros. Solúveis e Insolúveis em água
- Cadeias longas (~200 a ~ 7000 monômeros)

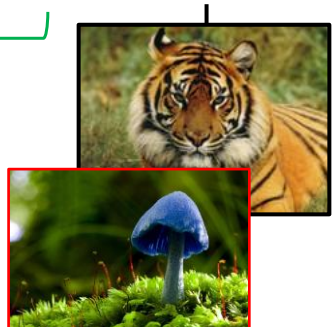
- **Função: estrutural e armazenamento de Energia a longo prazo**

Carboidrato	Monossacarídeo Constituinte
Amido	Glicose
Glicogênio	Glicose
Celulose	Glicose
Quitina	N- acetil glucosamina

17

Polissacarídeos de Glicose: Celulose, Amido e Glicogênio

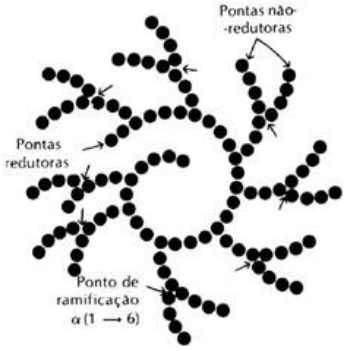




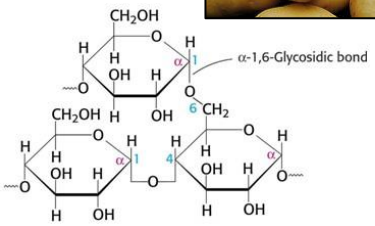
18

Reserva Energética – Vegetal

Amido: resíduos de Glicose com ligações α 1,4 e α 1,6.



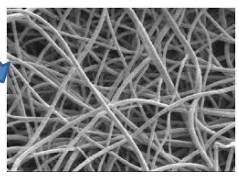
Amiloplasto

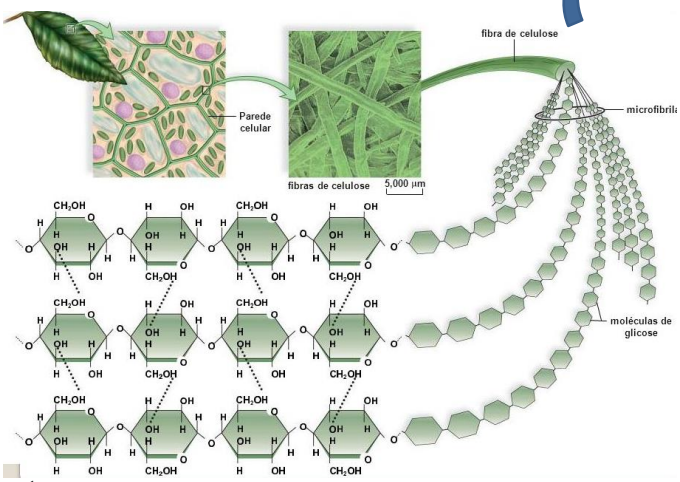


19

Estrutural – Parede Vegetal

Celulose : resíduo de Glicose ligações β 1,4; sem ramificação

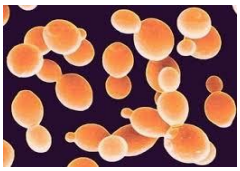




✓**Outros Polissacarídeos da Parede Vegetal : Hemicelulose e Pectina**

20

Importância Econômica – Celulose



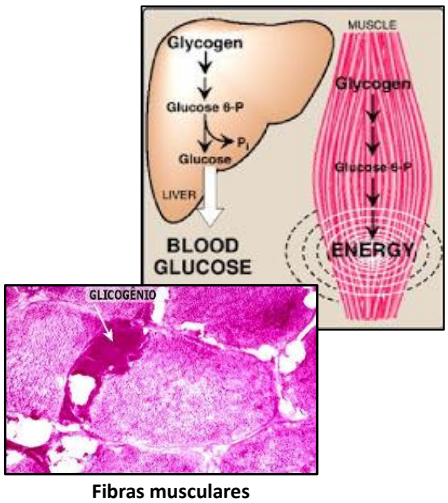
S. cerevisae

✓Não compete por alimentos

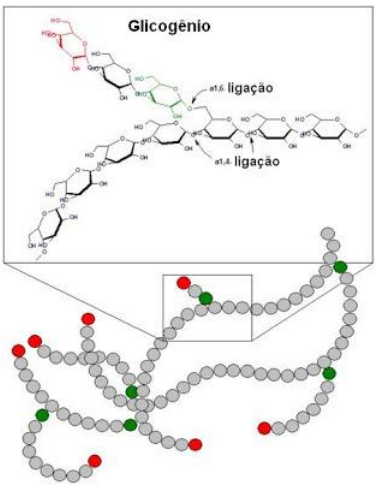
21

Reserva Energética – Animais e Fungos

Glicogênio: resíduos de Glicose ligações α 1,4 e α 1,6 (>)



Fibras musculares

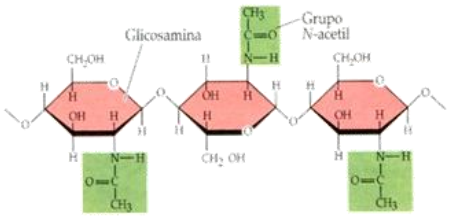


22

Estrutural – Insetos e Parede de Fungos

Quitina: Parede Celular de Fungos e Exoesqueleto de insetos

N-acetil glucosamina



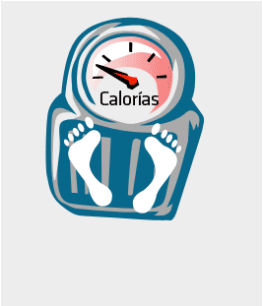
23

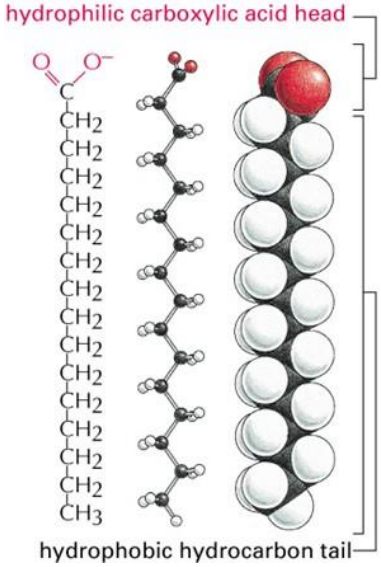
Lipídeos

24

Ácidos Graxos

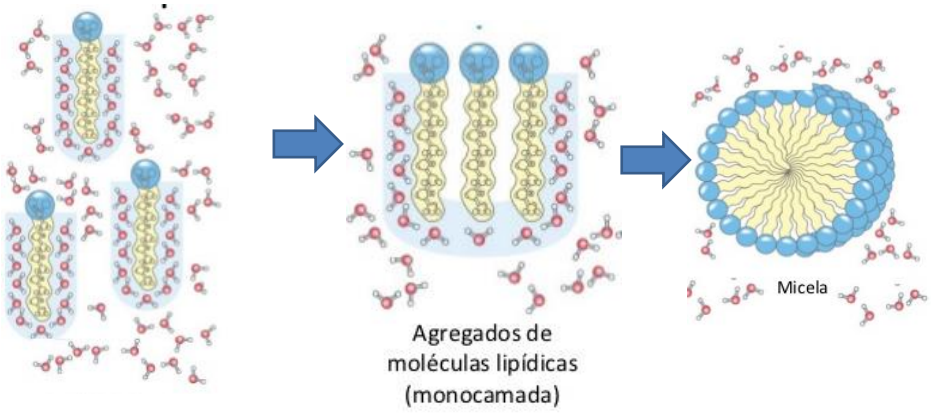
- ❑ Ácido carboxílico (Hidrofílico)
- ❑ Longa cadeia de hidrocarboneto (Hidrofóbica)





25

Ácidos Graxos: Comportamento em Meio Aquoso



26

Lipídeos

❖Características gerais :

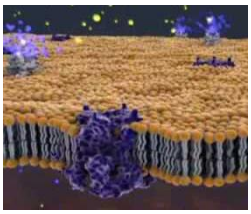
❑ Insolúveis em água;

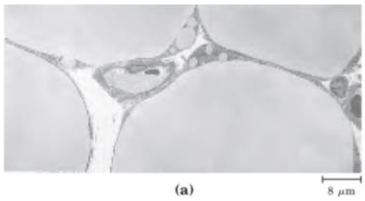
❑ Solúveis em solventes orgânicos;

❖ Função na célula :

❑ Estrutural

❑ Energética





27

Lipídeos: Importância Econômica

❑ Industria de Alimentos

❑ Farmacêutica

❑ Biocombustível

x

28

Lipídeos: Importância Econômica

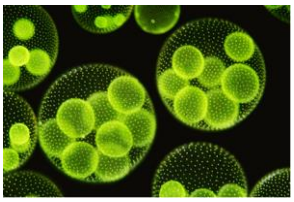
❖ **Biodisel** -a partir de óleos vegetais ou gordura animal

Microalga- Vantagens:

✓ Alto teor de óleo por peso seco (~80%)

✓Não compete por alimentos

✓Fácil cultivo



29

DIESEL X BIODIESEL

Diesel: n-Hexadecano

H_3C-CH_2- CH_2- CH_2- CH_2- CH_2- CH_2- CH_2- CH_2- CH_2- CH_2- CH_2- CH_2-CH_3

Biodiesel – Éster Etílico ou Metílico

Biodíesel Etílico

H_3C-CH_2- CH_2- CH_2- CH_2- CH_2- CH_2- CH_2- CH_2- CH_2- CH_2- CH_2- CH_2- CH_2-C(=O)-O-C_2H_5

Biodíesel Metílico

H_3C-CH_2- CH_2- CH_2- CH_2- CH_2- CH_2- CH_2- CH_2- CH_2- CH_2- CH_2- CH_2- CH_2- CH_2-C(=O)-O-CH_3

30

❑ Saturados

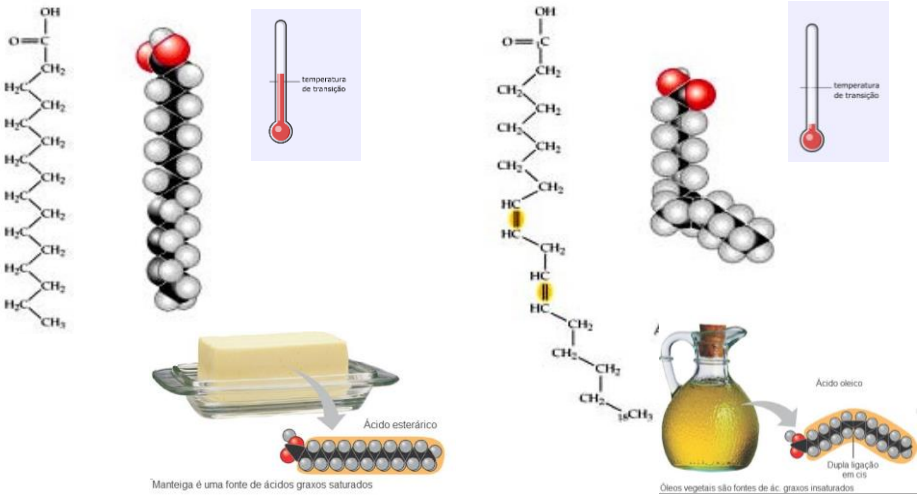
Menos solúvel

Maior ponto de fusão

❑ Insaturados (ligações duplas)

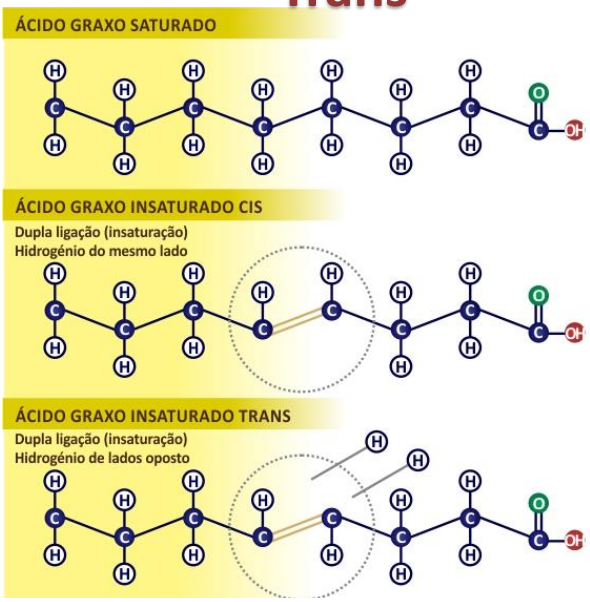
Mais solúvel

Menor ponto de fusão



31

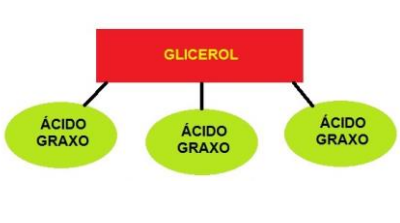
Ácidos Graxos Insaturados: Cis e Trans

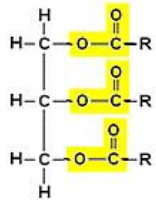


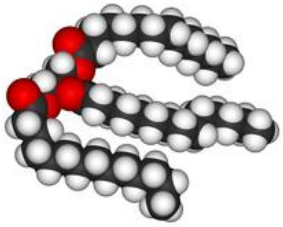
32

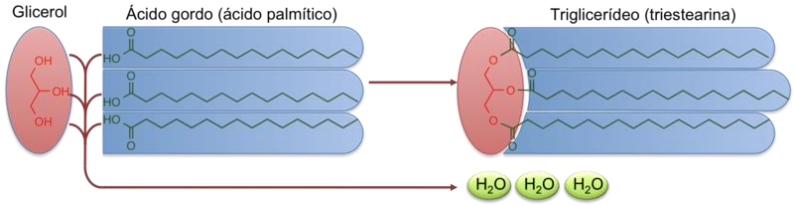
Triglicerídeos: Fonte de Energia

- 1 molécula de Glicerol conectado 3 ácidos Graxos
- Essencialmente Insolúvel







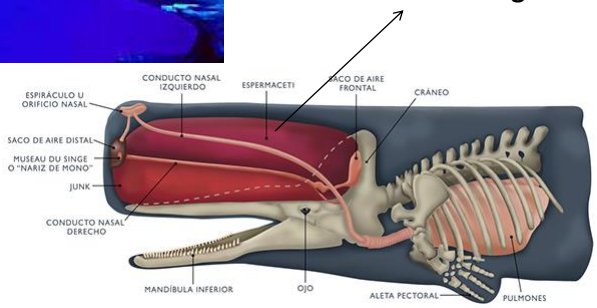


33

Outras funções dos Triglicerídeos

- Facilita o mergulho da baleia Cachalote

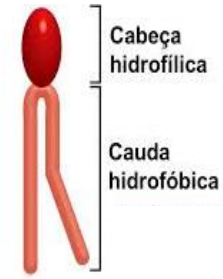
Até 3.600 kg de óleo

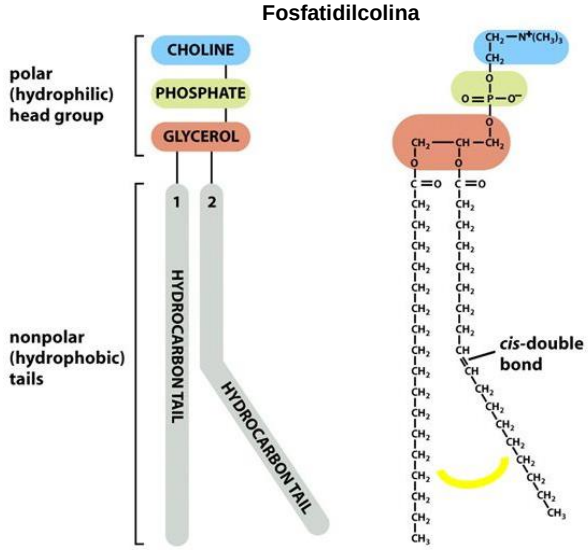


34

Lipídeos nas Membranas: Função Estrutural

❖ **Fosfolipídios**

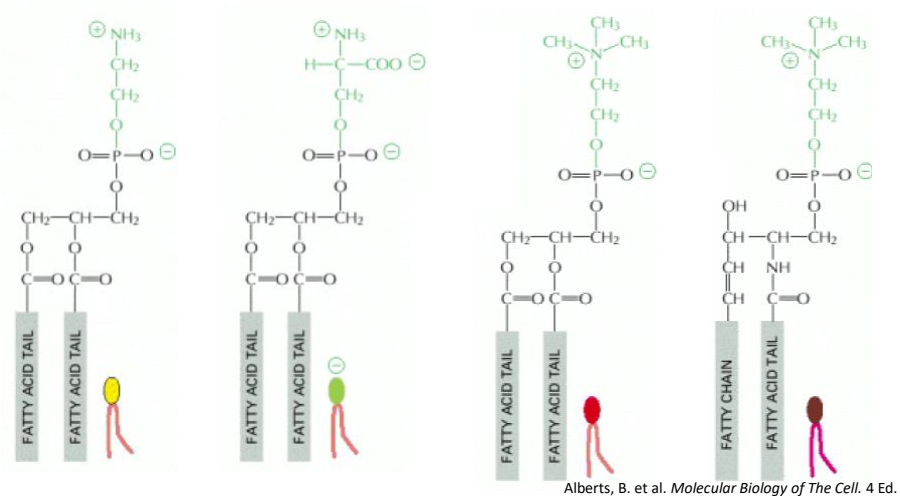




35

❖4 tipos de fosfolipídeos mais comuns.

Fosfatiletanolamina **Fosfatidilserina** **Fosfatidilcolina** **Esfingomielina**

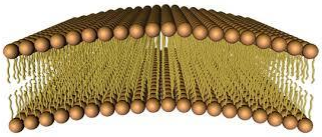


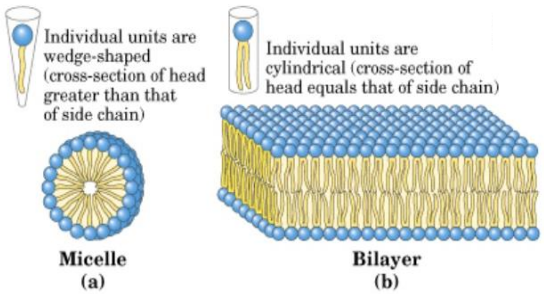
Alberts, B. et al. *Molecular Biology of The Cell.* 4 Ed.

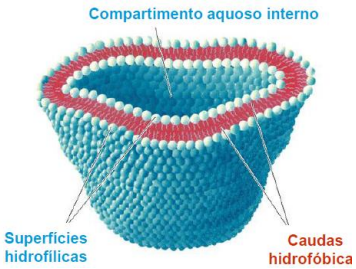
36

Lipídeos nas Membranas

❖ **Importante no surgimento das membranas**

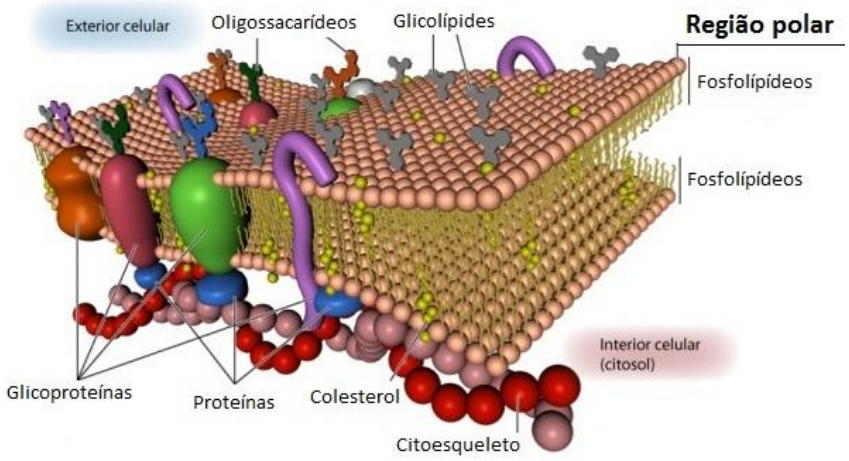






37

❖ **Bicamada fluídica de fosfolipídios**

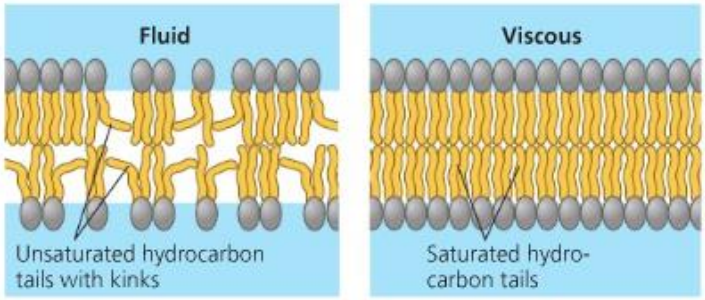


38

Ácidos Graxos Insaturados

✓ Insaturações nos Ácidos Graxos alteram a fluidez da membrana

✓ Vegetal X Animal



39