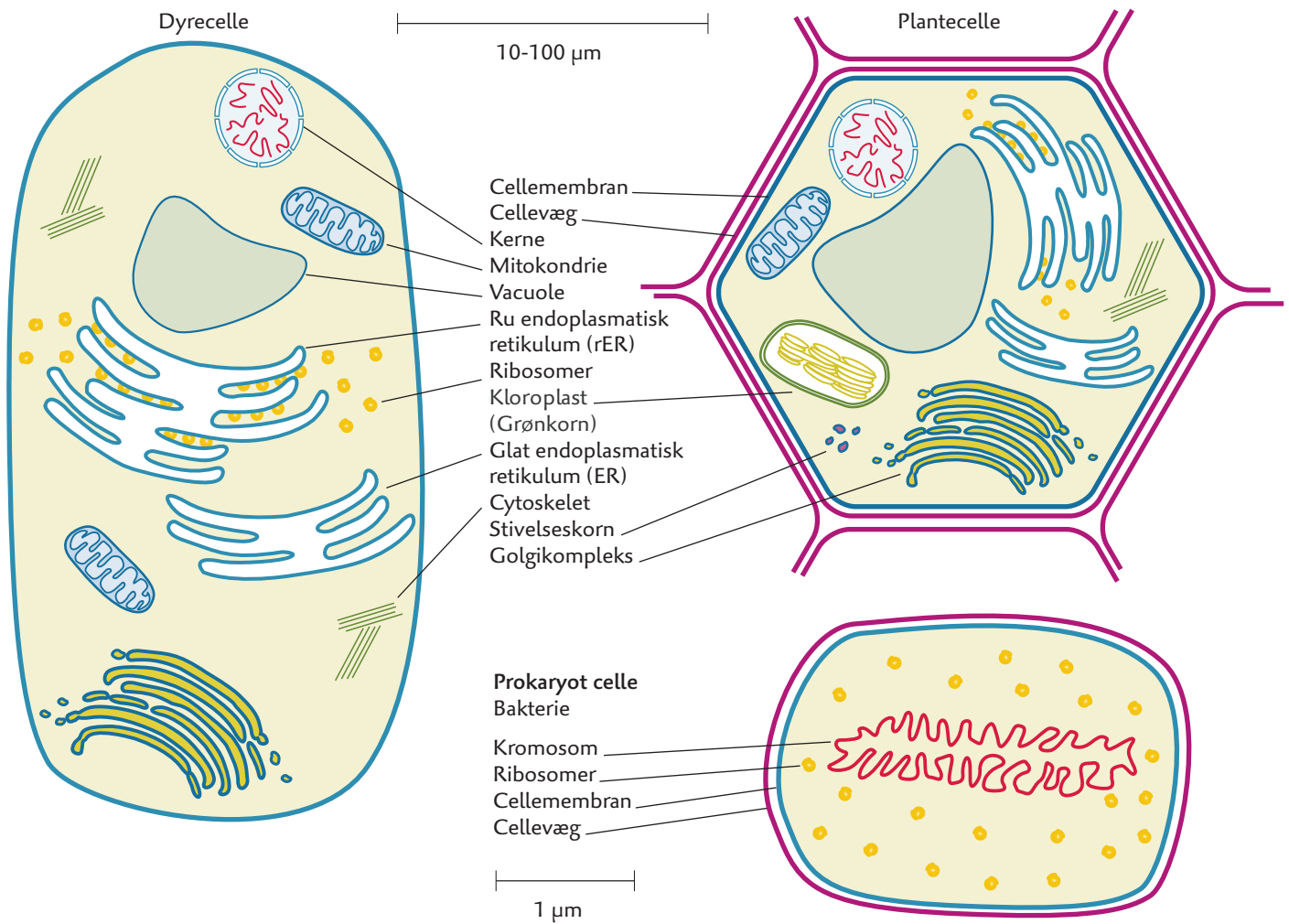


Figur 2. Forskellige cellers størrelse.  
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## Eukaryote celler



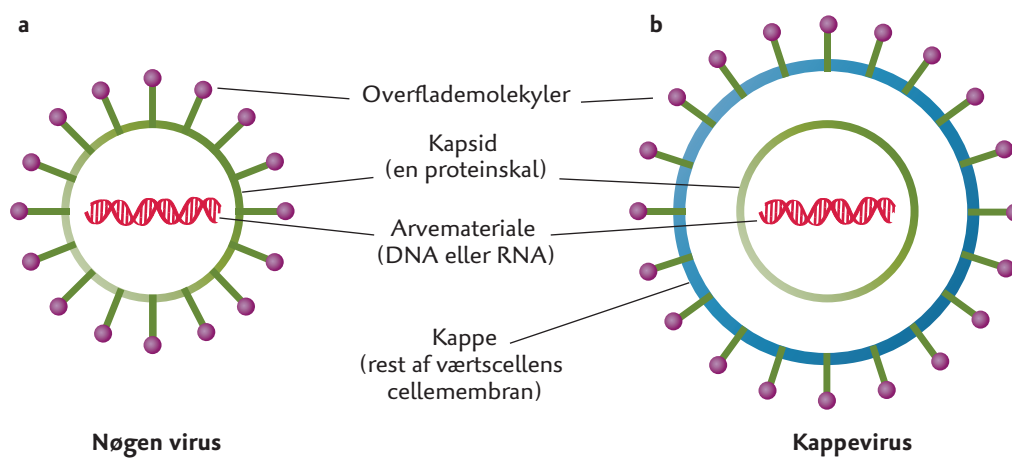
Figur 3. Plante-, dyre- og bakteriecelle. Se skema på næste side.  
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Organel	Funktion
Vakuole	Membranafgrænset hulrum i cellens cytoplasma. Regulerer plantecellens saftspænding. Vakuolen udgør ofte størstedelen af plantecellens volumen
Mitokondrier	Dobbeltmembranbeklædte organeller der laver respiration og dermed danner cellens energi i form af ATP. Indeholder sit eget DNA
Stivelseskorn	Vesikler med oplagringsnæring i form af polysaccharid
Cellekerne	Kaldes også nukleus. Indeholder cellens arvemateriale i form af DNA der er ordnet i kromosomer
Glat ER	Glat endoplasmatiske retikulum er et membransystem hvor der dannes membranlipider samt fx steroidhormoner, der udskilles fra cellen
Cytoplasma	Vandig substans mellem kerneområdet og cellemembranen. Cytoplasma indeholder cellens organeller samt diverse organiske og uorganiske forbindelser vedrørende cellens stofskifte
Cellemembran	Dobbeltlipidlag med membranproteiner. Afgrænser cellens indre og regulerer transporten af stoffer gennem membranen
Cellevæg	Består hos planter primært af polysacchariderne cellulose og hemicellulose samt lignin og har afstivende funktion. Hos svampe består den oftest af chitin som er et polysaccharid sammensat af acetyl-glucosaminenheder. Bakterier har cellevægge af peptidoglycan der er en blanding af carbohydrater og aminosyrer
Kloroplaster	Kaldes også grønkorn og er cellens fotosynteseorganeller. Indeholder det grønne pigment klorofyl der kan omdanne energi fra lys til kemisk energi bundet i glucose. Indeholder sit eget DNA
Golgikompleks	Transportorgan i cellen så forskellige forbindelser pakkes i vesikler og sendes rundt i cellen eller tømmes ud af cellen. Golgikompleks er et membransystem der pakker fx proteiner fra ER i vesikler der skal ud til cellemembranen
Ru ER med ribosomer	Det ru endoplasmatiske retikulum er et membransystem hvor proteiner modificeres og glycosyleres, dvs. tilkøbes carbohydrat
Ribosomer	Ribosomer består af protein og RNA. Danner cellens proteiner via proteinsyntesen
Cytoskelet	Cytoskelettet består af protein. Det har afstivende funktion og har betydning for transport af stoffer inde i cellen

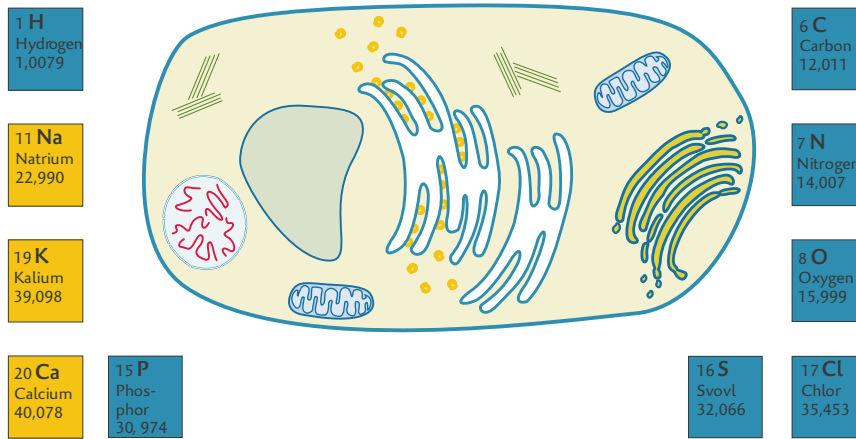
Figur 3. Organellernes funktion.

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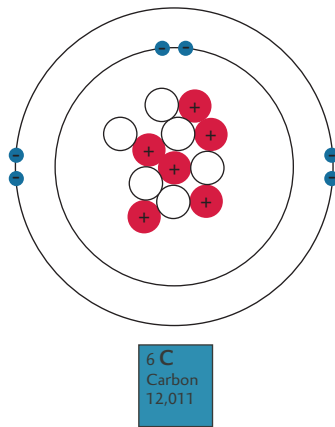
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Figur 4. Opbygningen af en virus.  
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Figur 5. Hyppigt forekommende grundstoffer i celler.  
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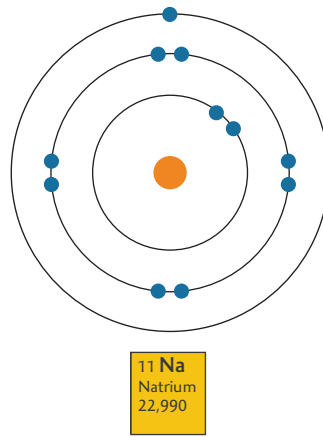
Figur 6. Model af carbonatom med elementarpartikler.  
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	Antal protoner	Antal neutroner	Atommasse	Hypighed
<sup>12</sup> C	6	6	12	98,93 %
<sup>13</sup> C	6	7	13	1,07 %
<sup>14</sup> C	6	8	14	Forsvindende lille del

Figur 7. Oversigt over carbonisotoper.

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Figur 8. Model af natriumatom.  
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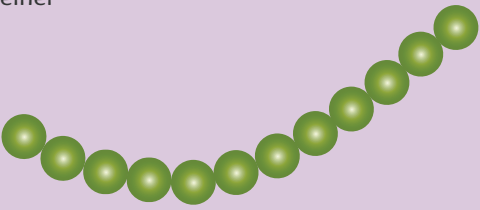
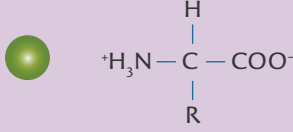
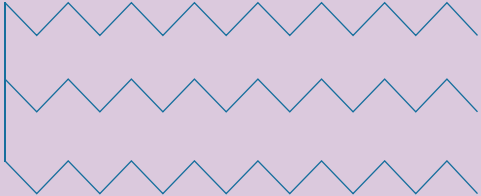
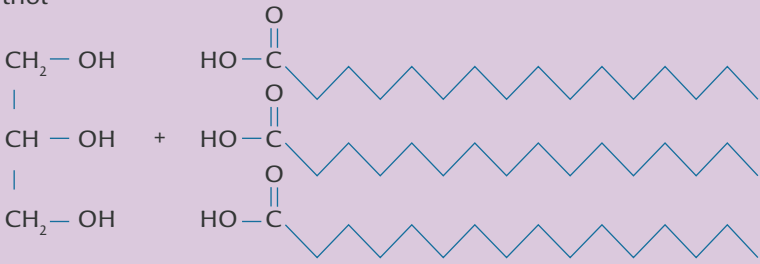
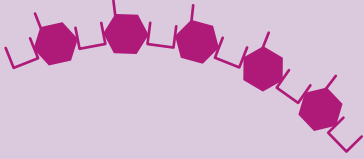


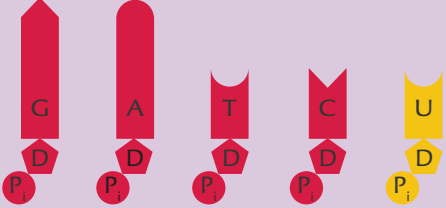


	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.					
	1.HG																	8.HG					
	1. <b>1 H</b> Hydrogen 1,0079																6 <b>C</b> Carbon 12,011	Atomsymbol Grundstoffets navn Atomvægt	2 <b>He</b> Helium 4,0026				
	2.HG																	3.HG	4.HG	5.HG	6.HG	7.HG	
	2. <b>3 Li</b> Lithium 6,941	<b>4 Be</b> Beryllium 9,0122																<b>5 B</b> Bor 10,812	<b>6 C</b> Carbon 12,011	<b>7 N</b> Nitrogen 14,007	<b>8 O</b> Oxygen 15,999	<b>9 F</b> Flour 18,998	<b>10 Ne</b> Neon 20,180
	3. <b>11 Na</b> Natrium 22,990	<b>12 Mg</b> Magnesium 24,305	Hovedgrupper (HG) fortæller hvor mange elektroner der er i atomets yderste skal Undergrupper (UG) metaller hvor elektronerne fordeler sig efter andre regler															<b>13 Al</b> Aluminium 26,982	<b>14 Si</b> Silicium 28,086	<b>15 P</b> Phosphor 30,974	<b>16 S</b> Svovl 32,066	<b>17 Cl</b> Chlor 35,453	<b>18 Ar</b> Argon 39,948
	4. <b>19 K</b> Kalium 39,098	<b>20 Ca</b> Calcium 40,078	<b>21 Sc</b> Scandium 44,956	<b>22 Ti</b> Titan 47,867	<b>23 V</b> Vanadium 50,942	<b>24 Cr</b> Chrom 51,996	<b>25 Mn</b> Mangan 54,938	<b>26 Fe</b> Jern 55,845	<b>27 Co</b> Cobalt 58,933	<b>28 Ni</b> Nikkel 58,693	<b>29 Cu</b> Kobber 63,546	<b>30 Zn</b> Zink 65,409	<b>31 Ga</b> Gallium 69,723	<b>32 Ge</b> Germanium 72,64	<b>33 As</b> Arsen 74,922	<b>34 Se</b> Selen 78,96	<b>35 Br</b> Brom 79,904	<b>36 Kr</b> Krypton 83,798					
	5. <b>37 Rb</b> Rubidium 85,468	<b>38 Sr</b> Strontium 87,62	<b>39 Y</b> Yttrium 88,906	<b>40 Zr</b> Zirconium 91,224	<b>41 Nb</b> Niobium 92,906	<b>42 Mo</b> Molybden 95,94	<b>43 Tc</b> Technetium (98)	<b>44 Ru</b> Ruthenium 101,07	<b>45 Rh</b> Rhodium 102,91	<b>46 Pd</b> Palladium 106,42	<b>47 Ag</b> Sølv 107,87	<b>48 Cd</b> Cadmium 112,41	<b>49 In</b> Indium 114,82	<b>50 Sn</b> Tin 118,71	<b>51 Sb</b> Antimon 121,76	<b>52 Te</b> Tellur 127,60	<b>53 I</b> Jod 126,90	<b>54 Xe</b> Xenon 131,29					
	6. <b>55 Cs</b> Cæsium 132,91	<b>56 Ba</b> Barium 137,33	<b>57 La</b> Lanthan 138,91	<b>72 Hf</b> Hafnium 178,49	<b>73 Ta</b> Tantal 180,95	<b>74 W</b> Wolfram 183,84	<b>75 Re</b> Rhenium 186,21	<b>76 Os</b> Osmium 190,23	<b>77 Ir</b> Iridium 192,22	<b>78 Pt</b> Platin 195,08	<b>79 Au</b> Guld 196,97	<b>80 Hg</b> Kviksølv 200,59	<b>81 Tl</b> Thallium 204,38	<b>82 Pb</b> Bly 207,2	<b>83 Bi</b> Bismuth 208,98	<b>84 Po</b> Polonium (209)	<b>85 At</b> Astat (210)	<b>86 Rn</b> Radon (222)					
	7. <b>87 Fr</b> Francium (223)	<b>88 Ra</b> Radium (226)	<b>89 Ac</b> Actinium (227)	<b>104 Rf</b> Rutherfordium (261)	<b>105 Db</b> Dubnium (262)	<b>106 Sg</b> Seaborgium (266)	<b>107 Bh</b> Bohrium (272)	<b>108 Hs</b> Hassium (270)	<b>109 Mt</b> Meitnerium (276)	<b>110 Ds</b> Darmstadtium (281)	<b>111 Rg</b> Roentgenium (280)	<b>112 Uub</b> Ununbium (285)	<b>113 Uut</b> Ununtrium (284)	<b>114 Uuq</b> Ununquadium (289)	<b>115 Uup</b> Ununpentium (288)	<b>116 Uuh</b> Ununhexium (289)							
Lanthanider	6.		<b>58 Ce</b> Cerium 140,12	<b>59 Pr</b> Praseodym 140,91	<b>60 Nd</b> Neodym 144,24	<b>61 Pm</b> Promethium (145)	<b>62 Sm</b> Samarium 150,36	<b>63 Eu</b> Europium 151,96	<b>64 Gd</b> Gadolinium 157,25	<b>65 Tb</b> Terbium 158,93	<b>66 Dy</b> Dysprosium 162,50	<b>67 Ho</b> Holmium 164,93	<b>68 Er</b> Erbium 167,26	<b>69 Tm</b> Thulium 168,93	<b>70 Yb</b> Ytterbium 173,04	<b>71 Lu</b> Lutetium 174,97							
Actinider	7.		<b>90 Th</b> Thorium 232,04	<b>91 Pa</b> Protactinium (231,04)	<b>92 U</b> Uran 238,03	<b>93 Np</b> Neptunium (237)	<b>94 Pu</b> Plutonium (244)	<b>95 Am</b> Americium (243)	<b>96 Cm</b> Curium (247)	<b>97 Bk</b> Berkelium (247)	<b>98 Cf</b> Californium (251)	<b>99 Es</b> Einsteinium (252)	<b>100 Fm</b> Fermium (257)	<b>101 Md</b> Mendelevium (258)	<b>102 No</b> Nobelium (259)	<b>103 Lr</b> Lawrencium (262)							

Figur side 13, det periodiske system.

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Stofklasse	Grundenheder
<p>Proteiner</p> 	<p>Aminosyrer</p> 
<p>Lipider</p> 	<p>Propan-1,2,3-triol      Fedtsyrer</p> 
<p>Carbohydrater</p> 	<p>Monosaccharider</p> 
<p>Nucleinsyrer</p> 	<p>Nucleotider</p> 

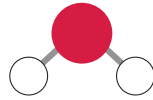
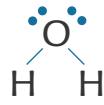
Figur 9. Cellens molekyler.  
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Organiske stoffer
Carbohydrater
Proteiner
Lipider
DNA
RNA
Uorganiske stoffer
H <sub>2</sub> O
CO <sub>2</sub>
O <sub>2</sub>
Na <sup>+</sup> , K <sup>+</sup> , Ca <sup>2+</sup> , Cl <sup>-</sup>
H <sub>2</sub> PO <sub>4</sub> <sup>-</sup> , HPO <sub>4</sub> <sup>2-</sup>
HCO <sub>3</sub> <sup>-</sup>

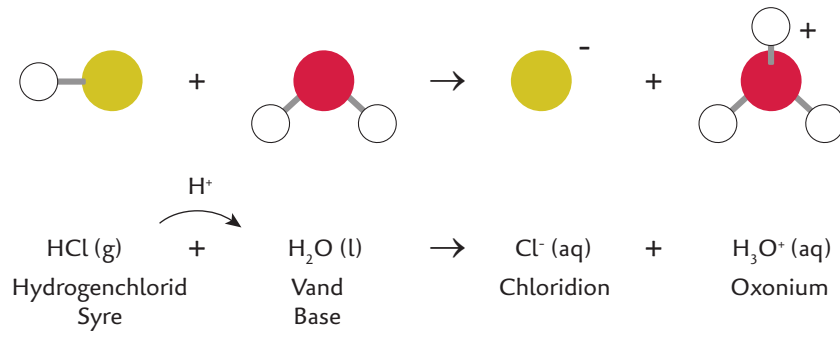
Figur 10. Eksempler på organiske og uorganiske stoffer i celler.  
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Tal	Talord på græsk
1	mono
2	di
3	tri
4	tetra
5	penta
6	hexa
7	hepta
8	octa
9	nona
10	deca

Figur 11. De græske talord  
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Figur 12. Vandmolekylets opbygning.  
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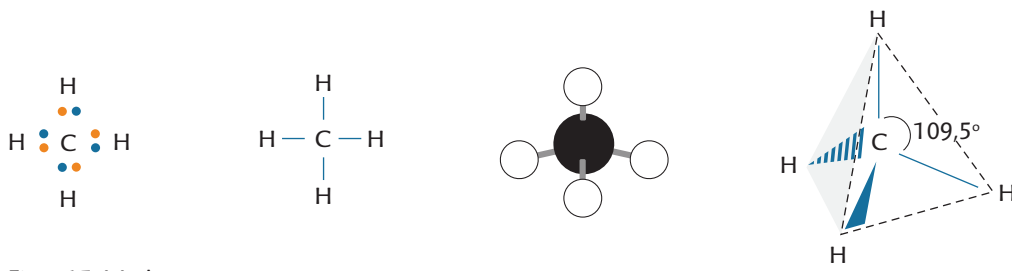
Figur 13. Syre-basereaktion.

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Figur 14. Dioxygen og dinitrogen.  
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Figur 15. Methan.  
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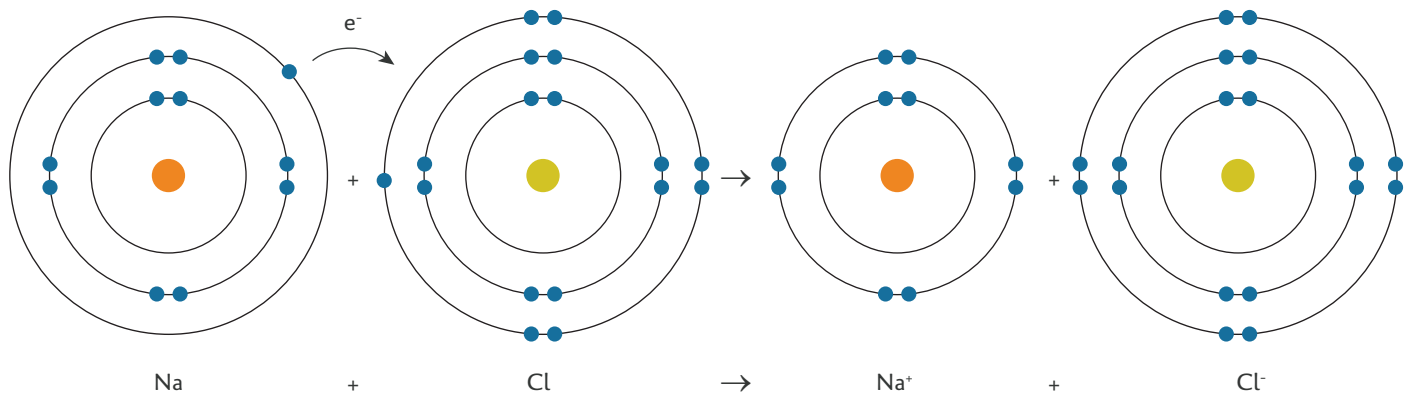


Ioner	Koncentration (mmol/L)
Na <sup>+</sup>	15
K <sup>+</sup>	120-150
Mg <sup>2+</sup>	43
Cl <sup>-</sup>	3
HCO <sub>3</sub> <sup>-</sup>	10
H <sub>2</sub> PO <sub>4</sub> <sup>-</sup> /HPO <sub>4</sub> <sup>2-</sup>	95
SO <sub>4</sub> <sup>2-</sup>	20

Figur 16. Ioner i celler.

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Figur 17. Elektronoverførsel.

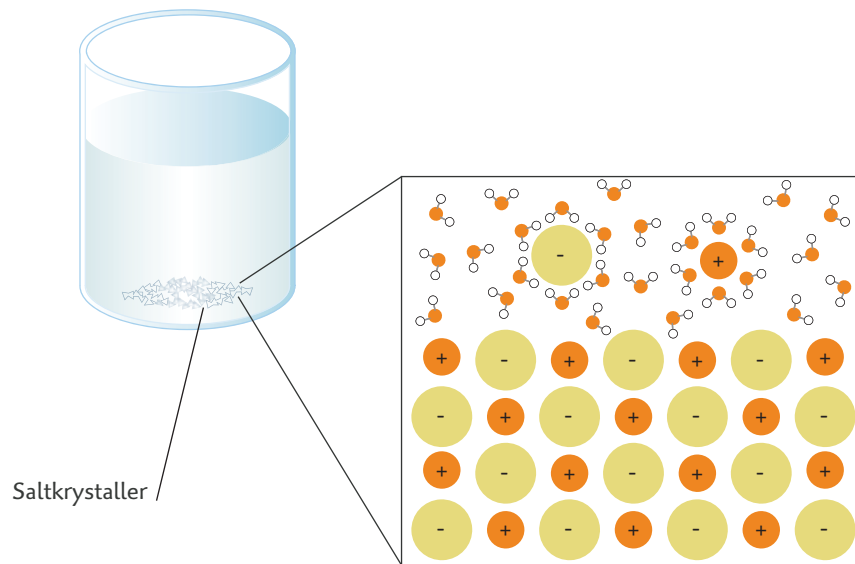
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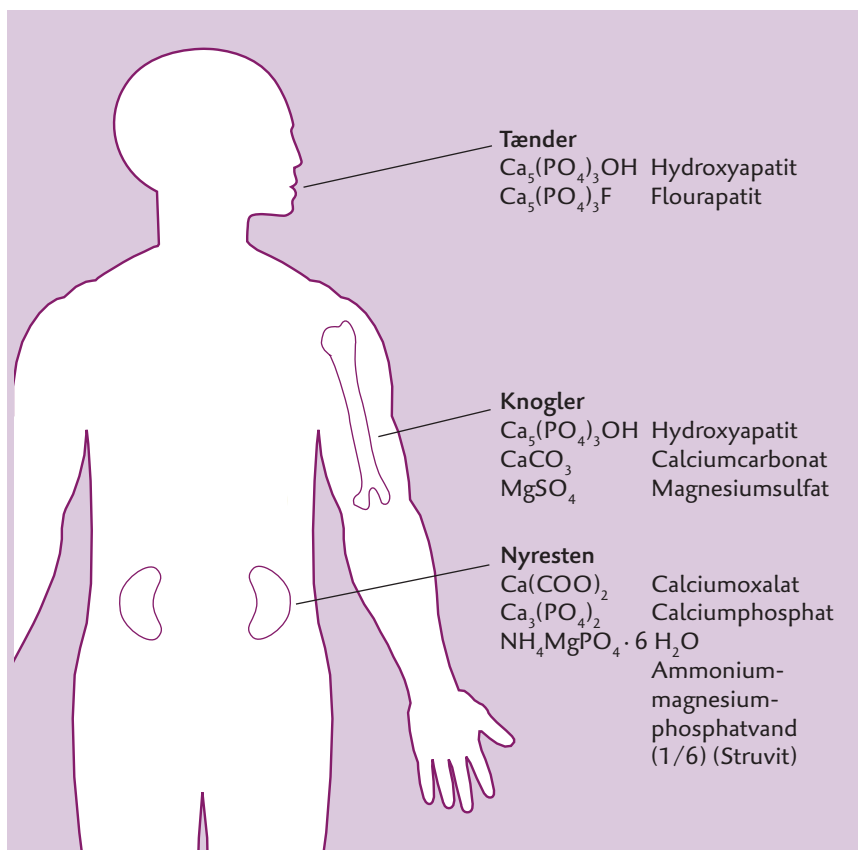
Kemisk formel	Navn
$\text{Ca}^{2+}$	Calciumion
$\text{Fe}^{2+}$	Jern(II)ion
$\text{Fe}^{3+}$	Jern(III)ion
$\text{H}^+$	Hydron
$\text{K}^+$	Kaliumion
$\text{Mg}^{2+}$	Magnesiumion
$\text{Na}^+$	Natriumion
$\text{Cl}^-$	Chloridion

Kemisk formel	Navn
$\text{H}_3\text{O}^+$	Oxonium
$\text{NH}_4^+$	Ammonium
$\text{HCO}_3^{2-}$	Hydrogencarbonat
$\text{CO}_3^{2-}$	Carbonat
$\text{OH}^-$	Hydroxid
$\text{PO}_4^{3-}$	Phosphat
$\text{HPO}_4^{2-}$	Hydrogenphosphat
$\text{H}_2\text{PO}_4^-$	Dihydrogenphosphat
$\text{SO}_4^{2-}$	Sulfat

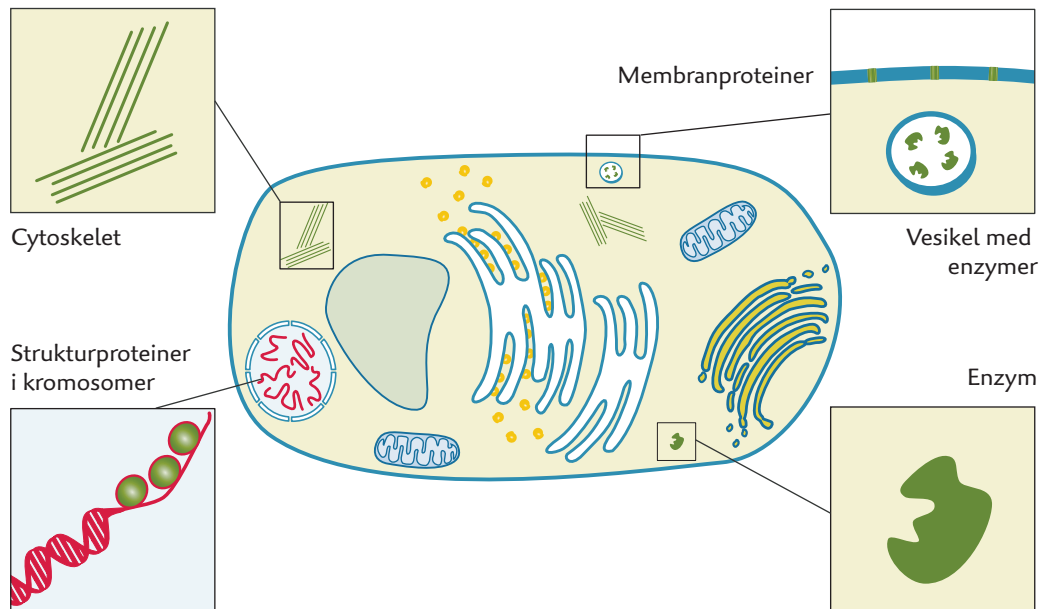
Figur 18. Enatomige og fleratomige ioner.  
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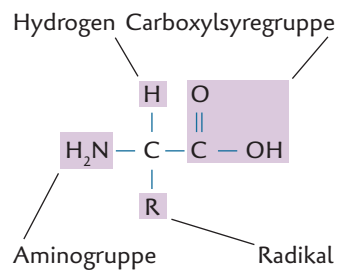
Figur 19. Hydratiserede ioner ved opløsning af NaCl i vand.  
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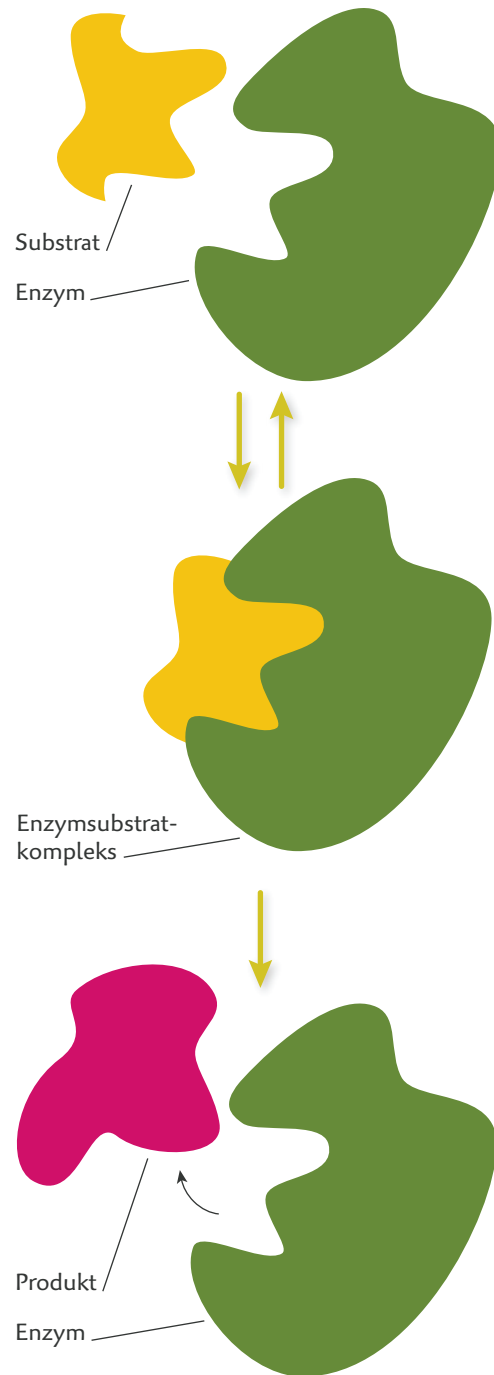
Figur 20. Eksempler på tungtopløselige salte i kroppen.  
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Figur 21. Dyrecelle hvor proteiner er fremhævet.  
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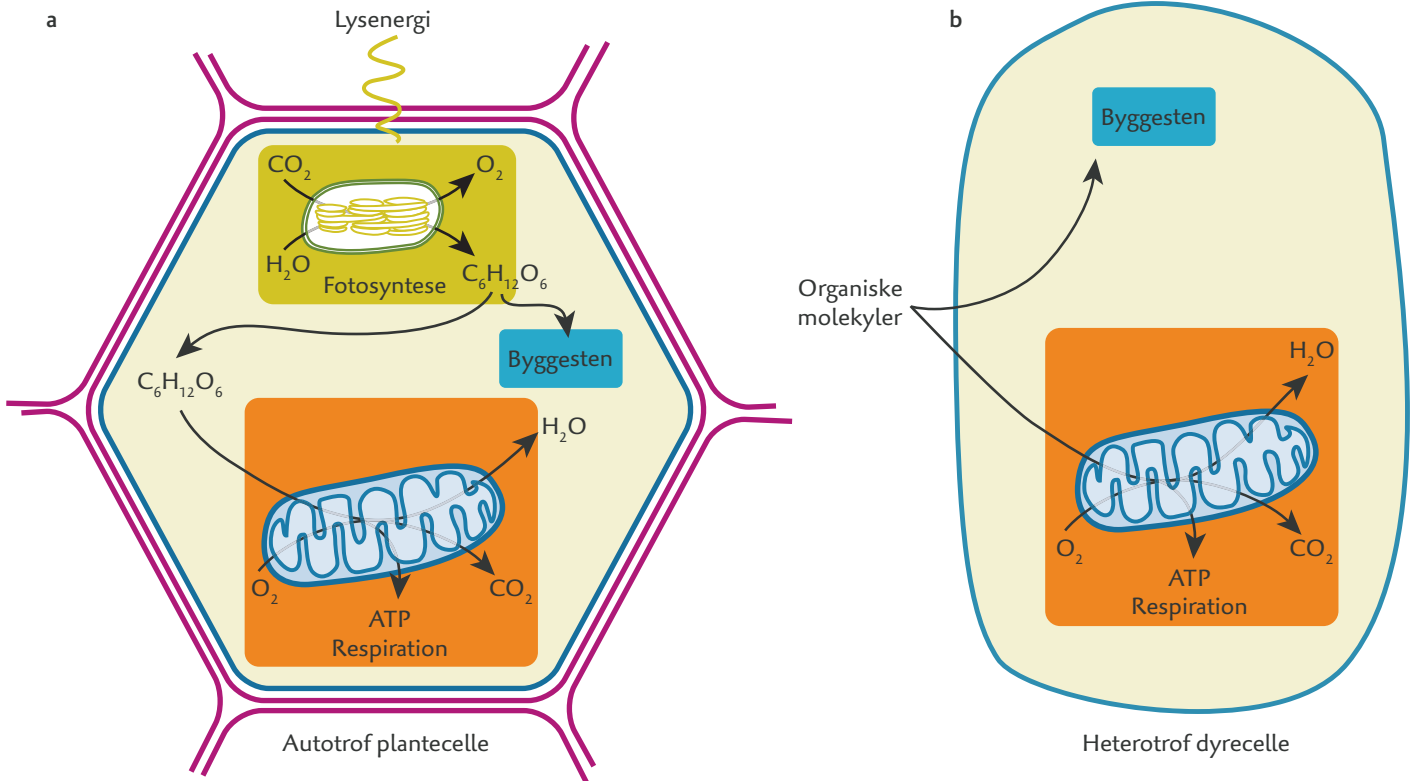


Figur 22. Aminosyrers opbygning.  
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Figur 23. Enzymeres funktion.  
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Figur 24. Autotrof og heterotrof levevis.  
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Bakterietype	Reaktion	Energigevinst	Kommentar
Fx <i>Nitrosomonas</i>	$\text{NH}_3 + 1\frac{1}{2} \text{O}_2 \rightarrow \text{H}^+ + \text{NO}_2^- + \text{H}_2\text{O}$ Ammoniak oxideres til nitrit	287 kJ/mol	Den vundne energi bruges til at danne organisk stof ud fra $\text{CO}_2$
Fx <i>Nitrospira</i>	$\text{NO}_2^- + \frac{1}{2} \text{O}_2 \rightarrow \text{NO}_3^-$ Nitrit oxideres til nitrat	76 kJ/mol	

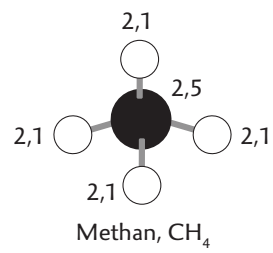
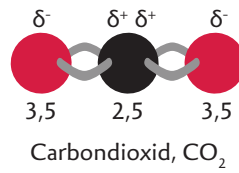
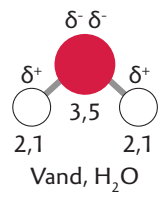
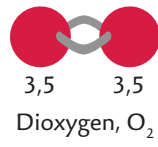
Figur 25. Nitrifikation.

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Na	K	Mg	Ca	C	P	N	H	S	Cl	O
0,9	0,8	1,2	1,0	2,5	2,1	3,0	2,1	2,5	3,0	3,5

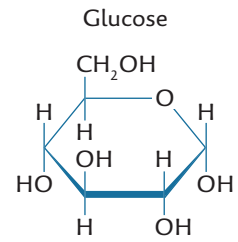
Figur 26. Elektronnegativitetsværdier for udvalgte grundstoffer.  
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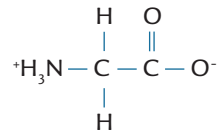
Figur 27. Vandmolekylmodeller.  
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Grundstoffer	Metal og ikke-metal	To ikke-metaller	To ikke-metaller
Bindingstype	Ionbinding	Polær elektronparbinding	Upolær elektronparbinding
Karakteristik	Ikke-metallatomet modtager en eller flere elektroner fra metallatomet	Der er ikke ligelig fordeling af de bindende elektroner	Der er ligelig fordeling af de bindende elektroner
Forskel i EN-værdi	Over 1,8	0,5-1,8	0-0,5
Eksempel	$K^+ Cl^-$	H-Cl	O=O

Figur 28. Oversigt over bindingstyper.  
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Aminoethansyre (glycin)



Figur 29. Glucose og aminoethansyre.  
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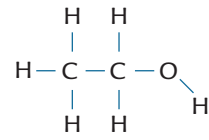
Navn	Strukturformel	Opløselighed g/100 mL vand
Methanol	$\text{CH}_3 - \text{O} - \text{H}$	*
Ethanol	$\text{CH}_3 - \text{CH}_2 - \text{O} - \text{H}$	*
Propan-1-ol	$\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{O} - \text{H}$	*
Butan-1-ol	$\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{CH}_2 - \text{O} - \text{H}$	7,4
Pentan-1-ol	$\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{CH}_2 - \text{CH}_2 - \text{O} - \text{H}$	2,7
Hexan-1-ol	$\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{CH}_2 - \text{CH}_2 - \text{CH}_2 - \text{O} - \text{H}$	0,6

Figur 30. Opløselighed af alkoholer ved 20 °C.

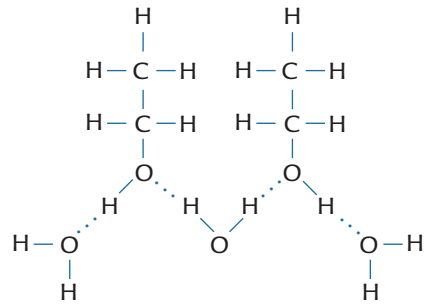
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a

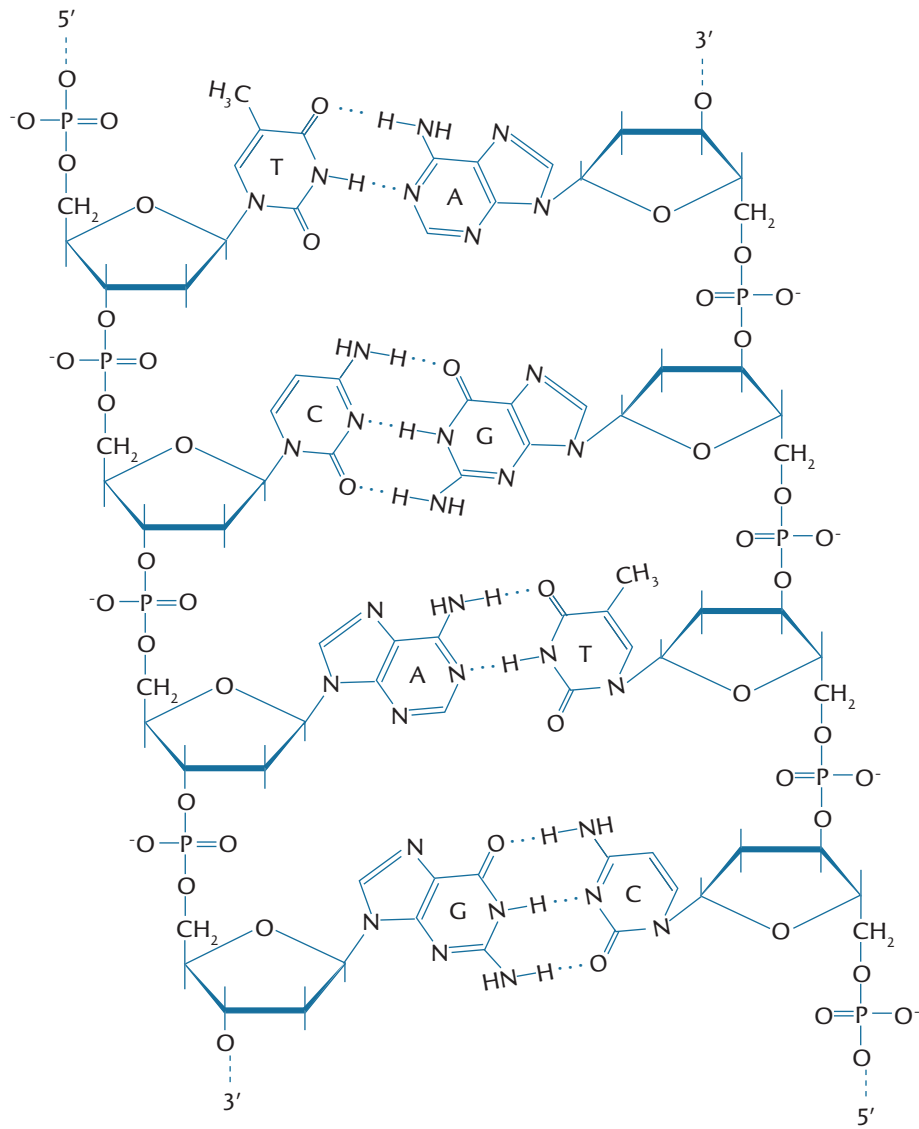


b

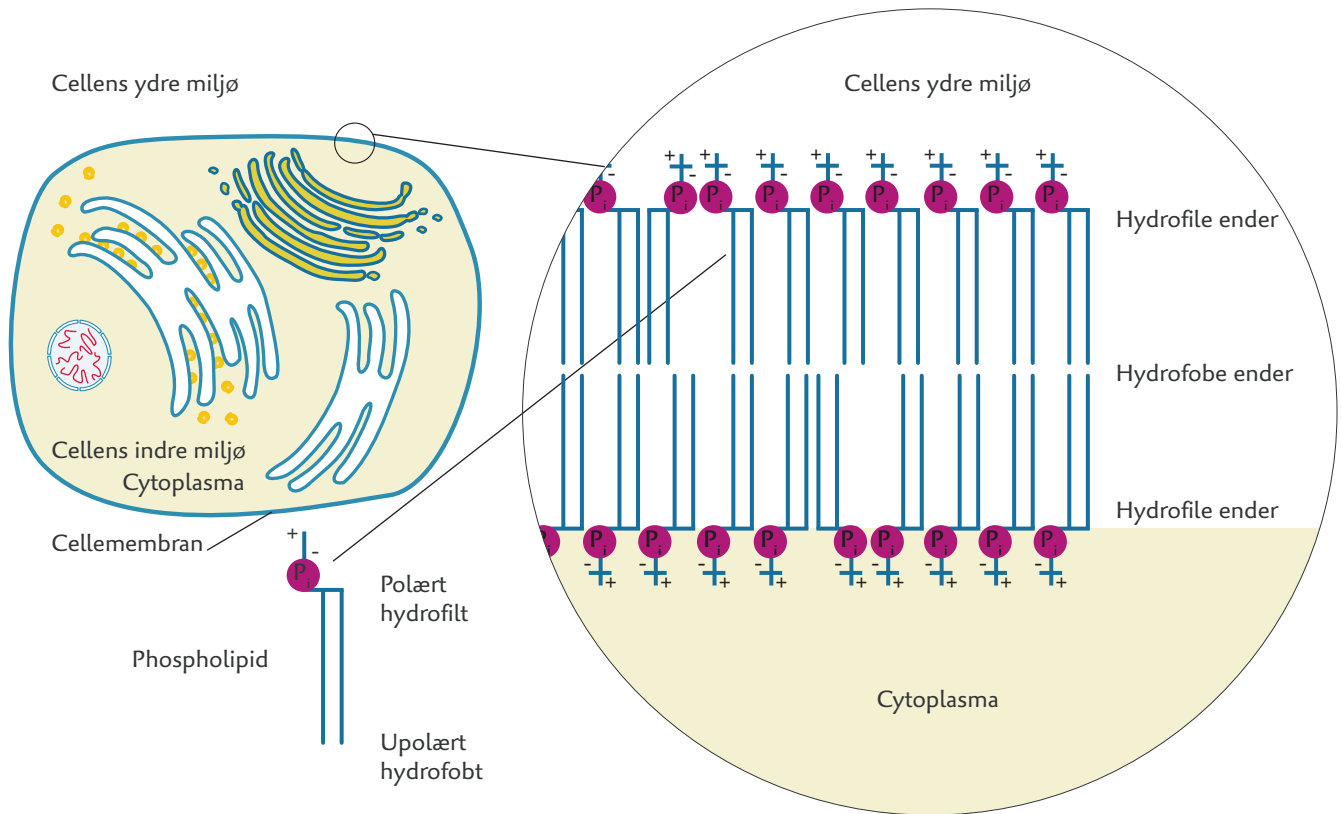


Figur 31. a. Ethanolmolekyle. b. To ethanolmolekyler.  
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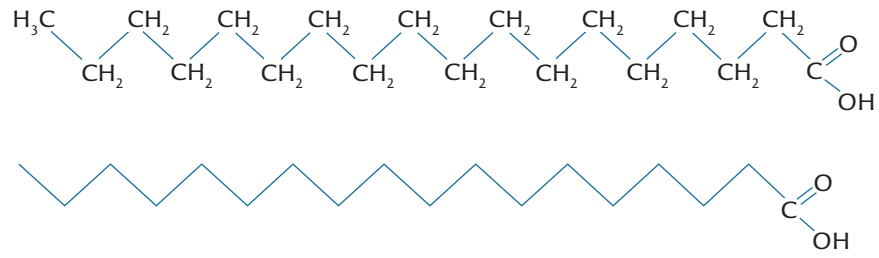




Figur 32. Hydrogenbindinger i DNA.  
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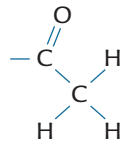
Figur 33. Cellemembranens opbygning.  
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Figur 34. Octadecansyre.

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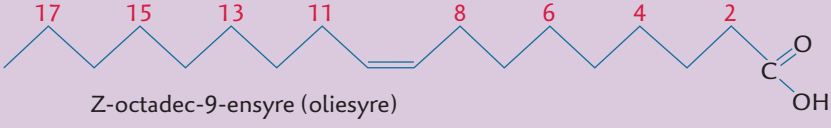
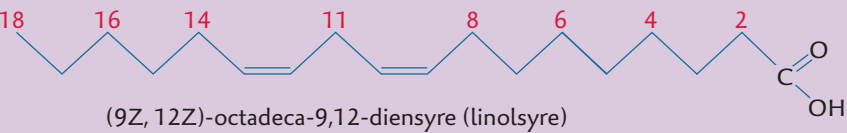
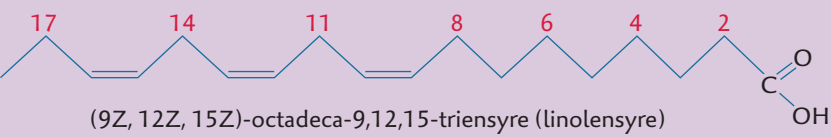
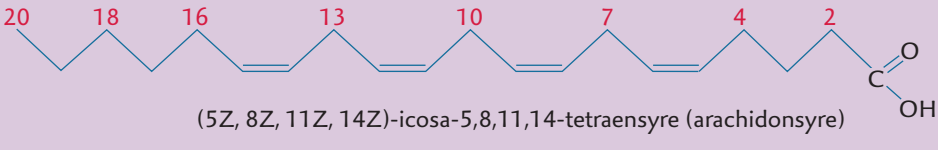
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Figur 35. Ethanoylgruppe.

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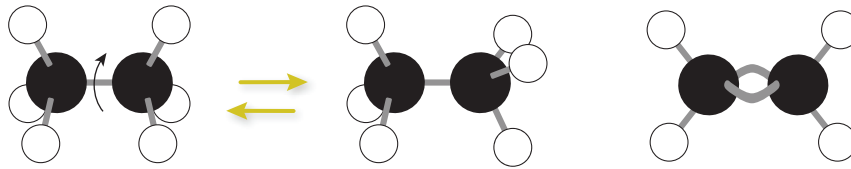
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Fedtsyre	Smeltepunkt °C
 <p>Hexadecansyre (palmitinsyre)</p>	63
 <p>Octadecansyre (stearinsyre)</p>	69
 <p>Z-octadec-9-ensyre (oliesyre)</p>	13
 <p>(9Z, 12Z)-octadeca-9,12-diensyre (linolsyre)</p>	-5
 <p>(9Z, 12Z, 15Z)-octadeca-9,12,15-triensyre (linolensyre)</p>	-11
 <p>(5Z, 8Z, 11Z, 14Z)-icosa-5,8,11,14-tetraensyre (arachidonsyre)</p>	-49,5

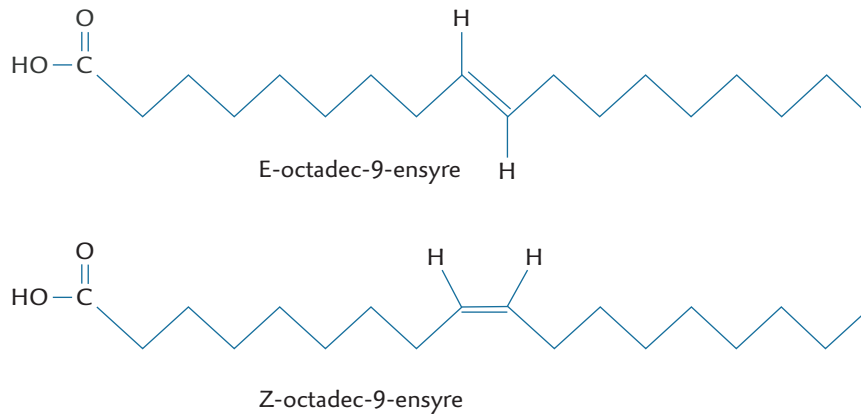
Figur 36. Eksempler på mættede og umættede fedtsyrer.

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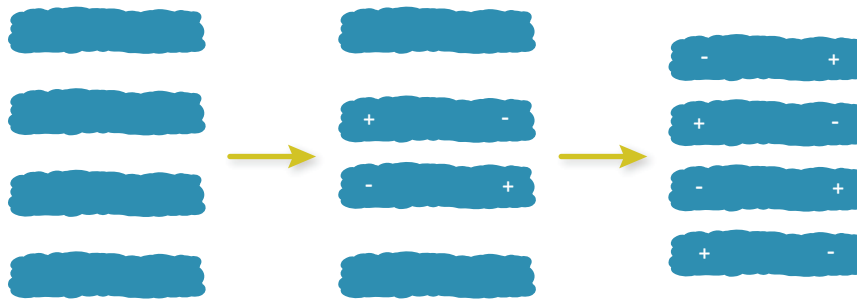
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Figur 37. Carbonhydrider med enkelt- og dobbeltbindinger.  
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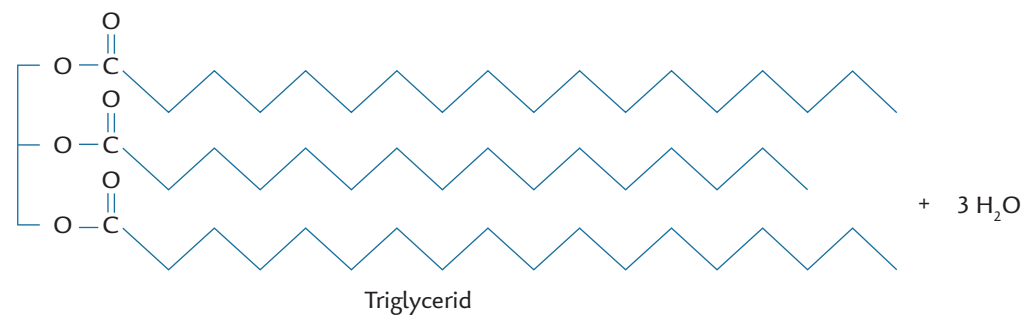
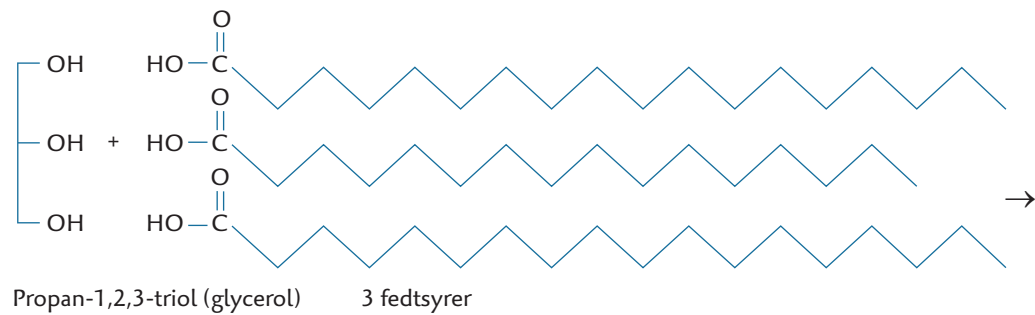
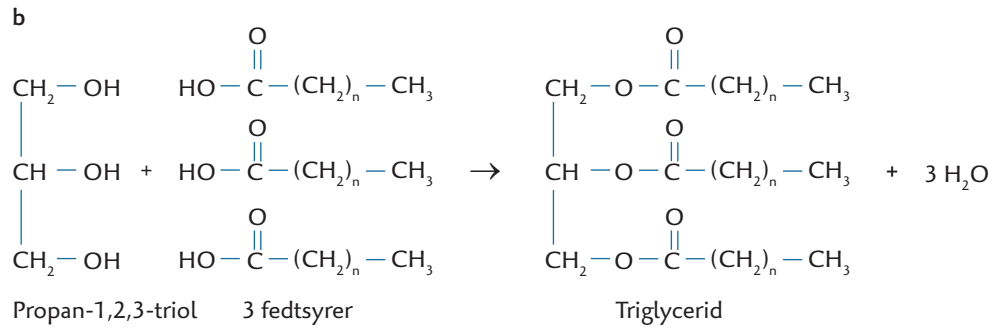
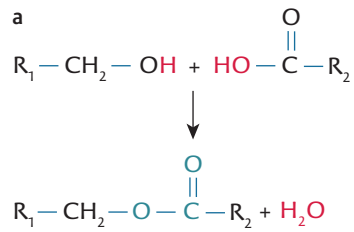


Figur 38. Isomere former af octadec-9-ensyre.  
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Figur 39. Nabomolekyler kan påvirke hinandens elektronsystemer.  
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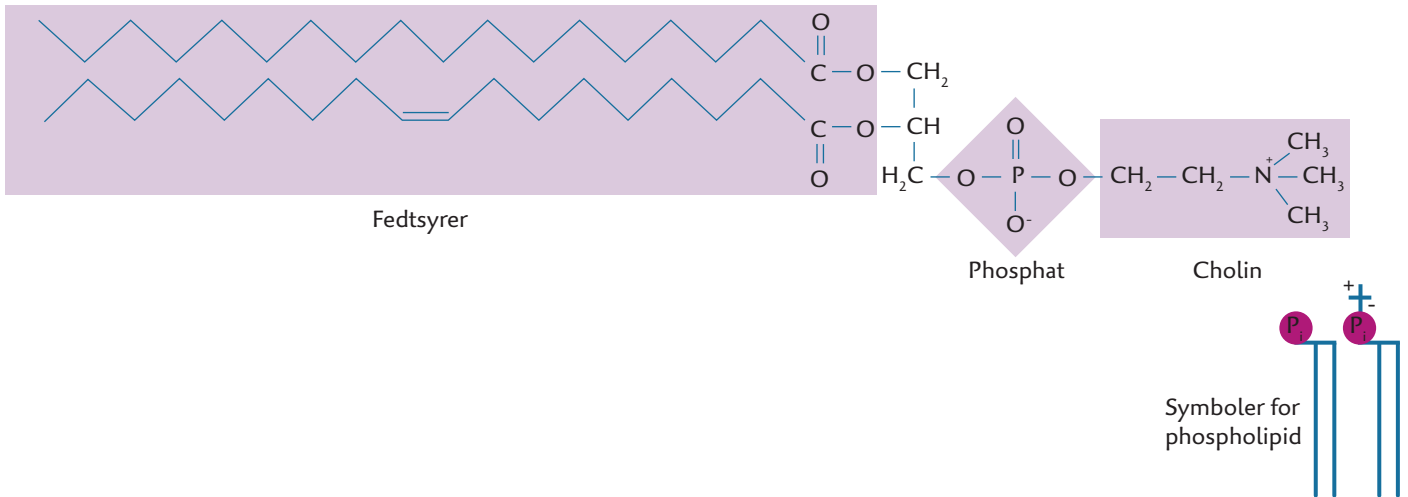




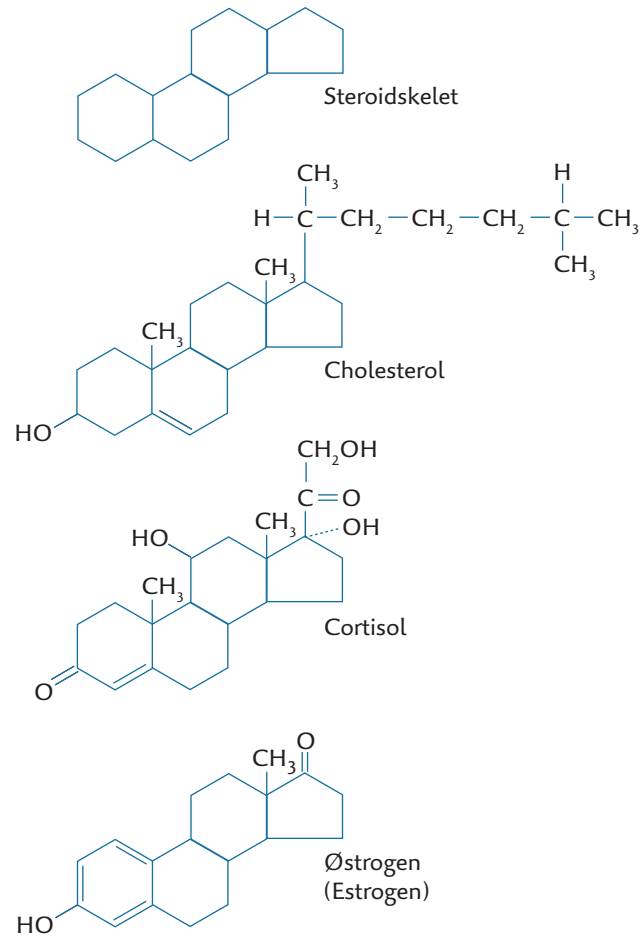
Figur 40. a. Kondensationsreaktion. b. Dannelse af triglycerid.  
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Levnedsmiddel	Rejer	Torsk, filet, rå	Makrel, rå	Kylling, kød og skind, rå	Svinekød uspecificeret ca. 20 % fedt, rå	Lammekød uspecificeret, rå	Oksekød uspecificeret middelfedt, rå
Masseprocent af fedt	0,88	0,4	22,6	10,8	17,6	27,7	13,2
<b>Fedtsyrer:</b>							
C 12:0 laurinsyre dodecansyre				0,2			
C 14:0 myristinsyre tetradecansyre			6,9	0,9	1,7	5,5	3,2
C 16:0 palmitinsyre hexadecansyre	22,2	33,1	16,3	22,9	26,1	24,8	27,0
C 18:0 stearinsyre octadecansyre			2,9	6,3	13,3	21,4	13,0
<b>Mættede fedtsyrer i alt</b>	<b>22,2</b>	<b>33,1</b>	<b>26,1</b>	<b>30,3</b>	<b>41,1</b>	<b>51,7</b>	<b>43,2</b>
C 16:1 palmitolsyre (Z)-hexadec-9-ensyre	11,1		3,6	6,0	3,3	1,3	6,3
C 18:1 oliesyre (Z)-octadec-9-ensyre	11,1		17,9	37,7	42,2	39,1	42,0
C 20:1 gadolsyre (Z)-icosa-11-ensyre	11,1		8,2	1,1	1,1		
C 22:1 erucasyre (Z)-docos-13-ensyre			13,5				
<b>Monoumættede fedtsyrer i alt</b>	<b>33,3</b>		<b>43,2</b>	<b>44,8</b>	<b>46,6</b>	<b>40,4</b>	<b>48,3</b>
C 18:2 linolsyre (9Z,12Z)-octadeca-9,12-diensyre			3,6	21,0	8,9	2,6	2,0
C 18:3 linolensyre (9Z,12Z,15Z)-octadeca-9,12,15-triensyre			1,3	1,0	1,1	2,6	1,3
C 20:4 arakidonsyre (5Z,8Z,11Z,14Z)-icosa-5,8,11,14-diensyre				0,6			1,0
C 20:5 eicosapentaensyre (5Z,8Z,11Z,14Z,17Z)-eicosa-5,8,11,14,17-pentensyre	22,2	33,1	5,4	0,1			
C 22:6 docosahexaensyre (4Z,7Z,10Z,13Z,16Z,19Z)-docosa-4,7,10,13,16,19-hexensyre	22,2	33,1	14,5	0,2			
<b>Polyumættede fedtsyrer i alt</b>	<b>44,4</b>	<b>66,2</b>	<b>24,8</b>	<b>22,9</b>	<b>10,0</b>	<b>5,2</b>	<b>4,3</b>
Andre fedtsyrer	0,1	0,7	5,9	2,0	2,3	2,7	4,2

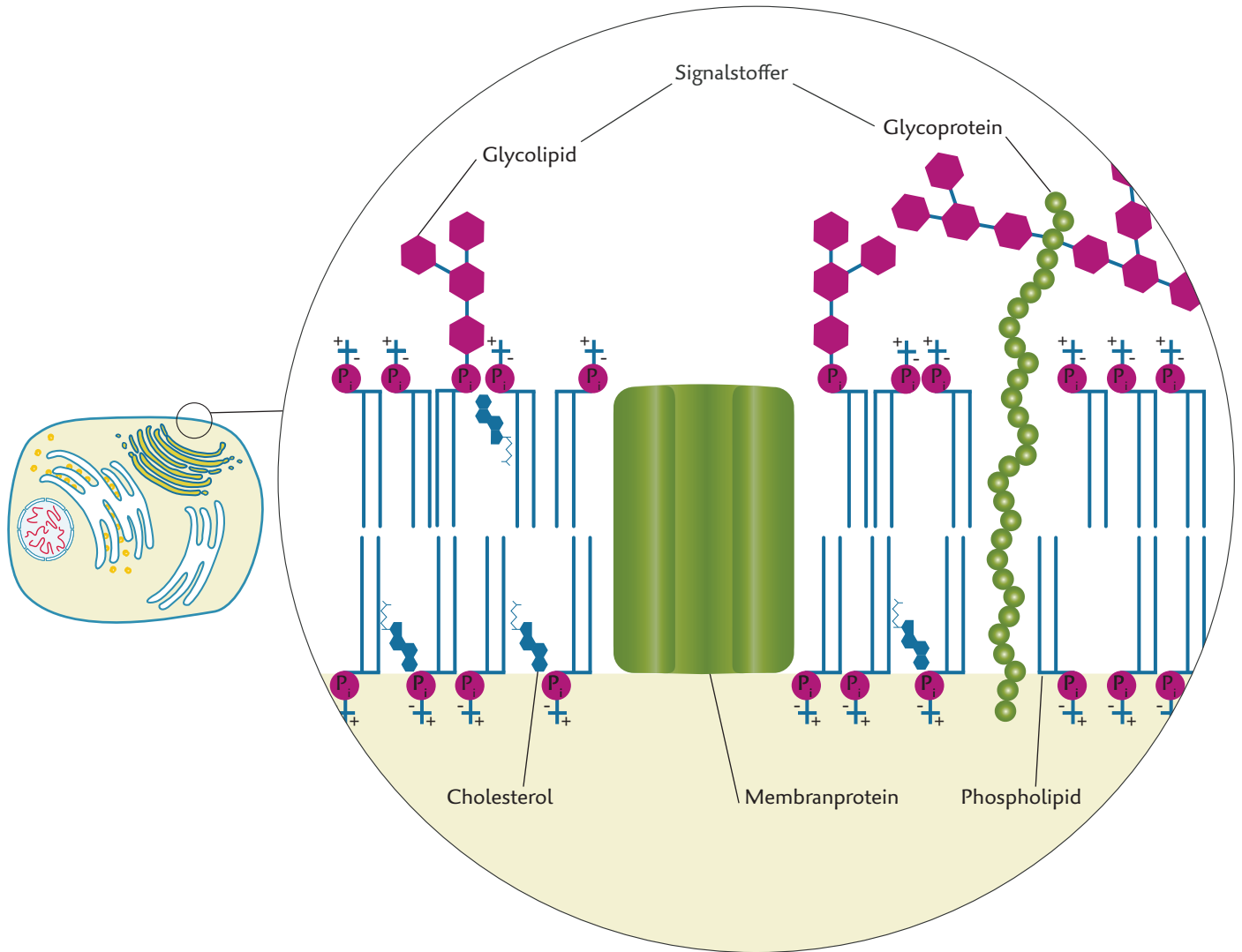
Figur 41. Sammensætning af fedtsyrer i forskellige animalske produkter.  
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Figur 42. Eksempel på phospholipid.  
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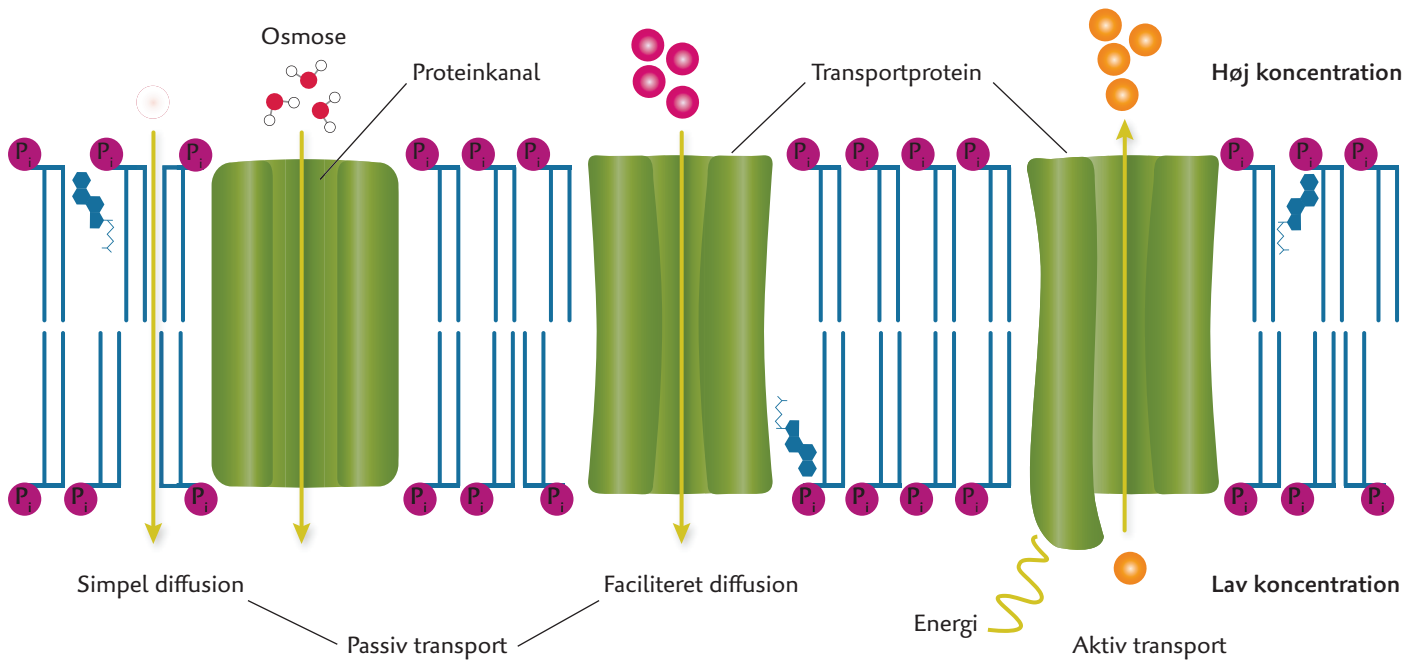
Figur 43. Steroidskelet og eksempler på stoffer der indeholder et steroidskelet.  
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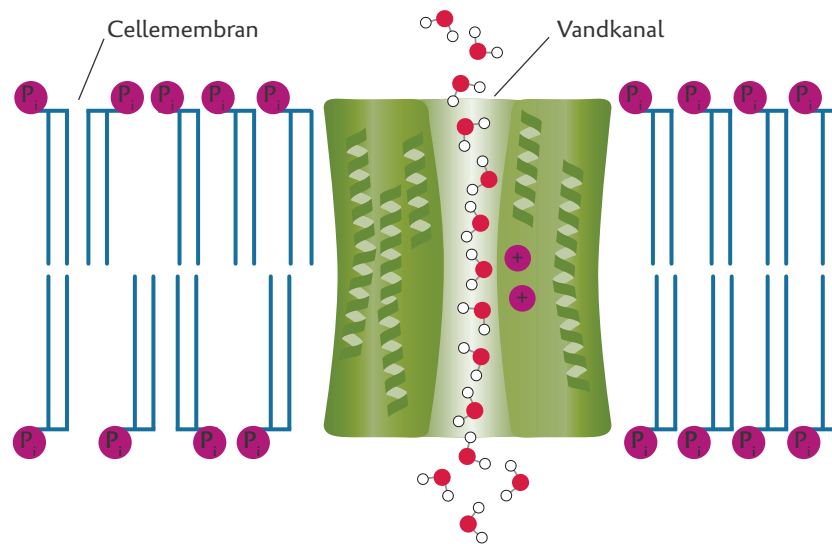
Figur 44. Cellemembranens molekyler.  
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Ionkoncentration		
	Intracellulært	Ekstracellulært
Na <sup>+</sup>	10 mM	140 mM
K <sup>+</sup>	140 mM	4 mM
Ca <sup>2+</sup>	0,0001 mM	2 mM

Figur 45. Koncentration af stoffer inden i og uden for cellen.  
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Figur 46. Membrantransportprocesser.  
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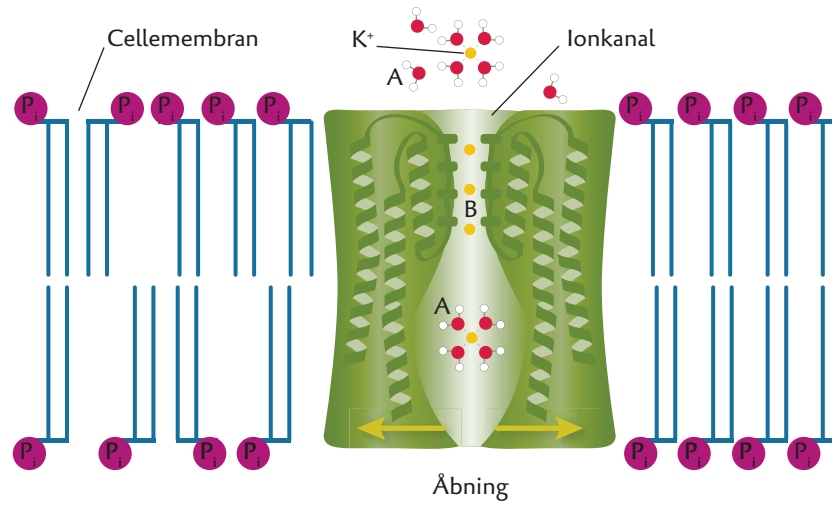


Figur 47. Vandkanal.

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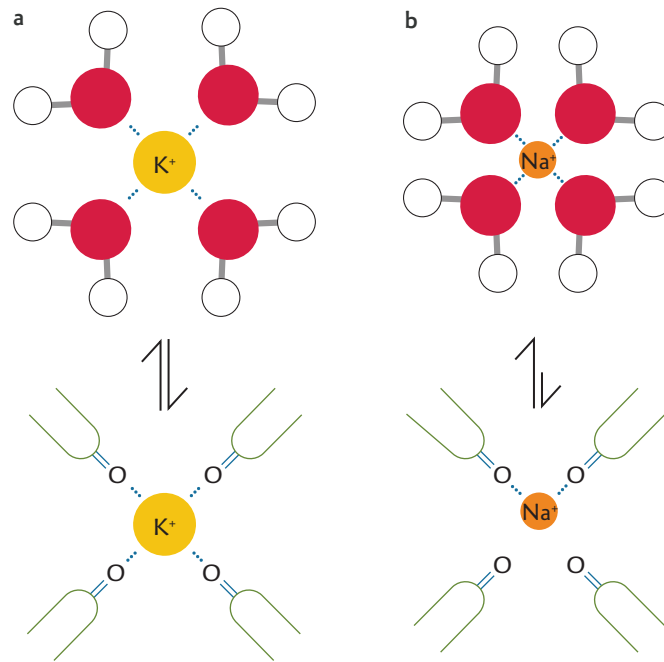




Figur 48. Kaliumkanal.

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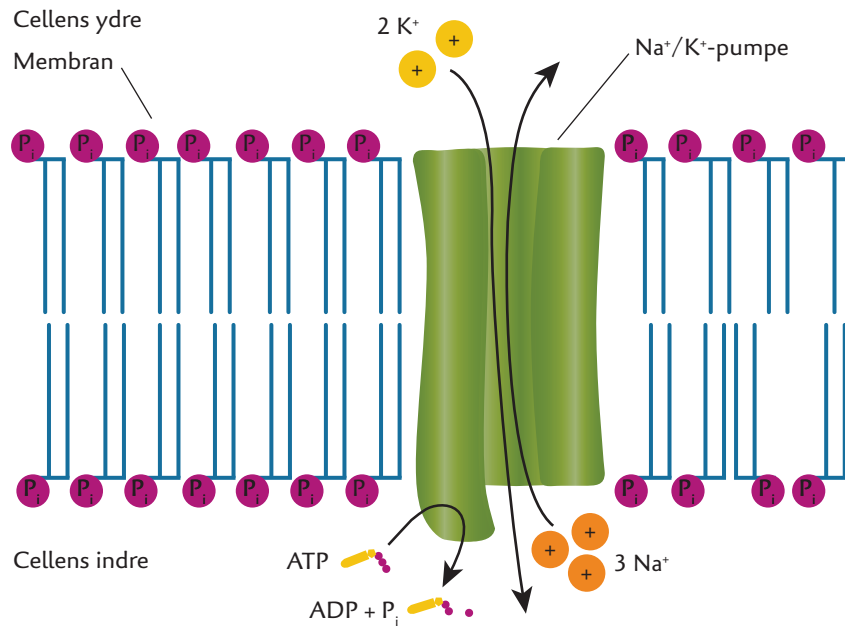
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Figur 49. Kaliumioners (a) og natriumioners (b) placering i vandige omgivelser i forhold til oxygenatomerne.

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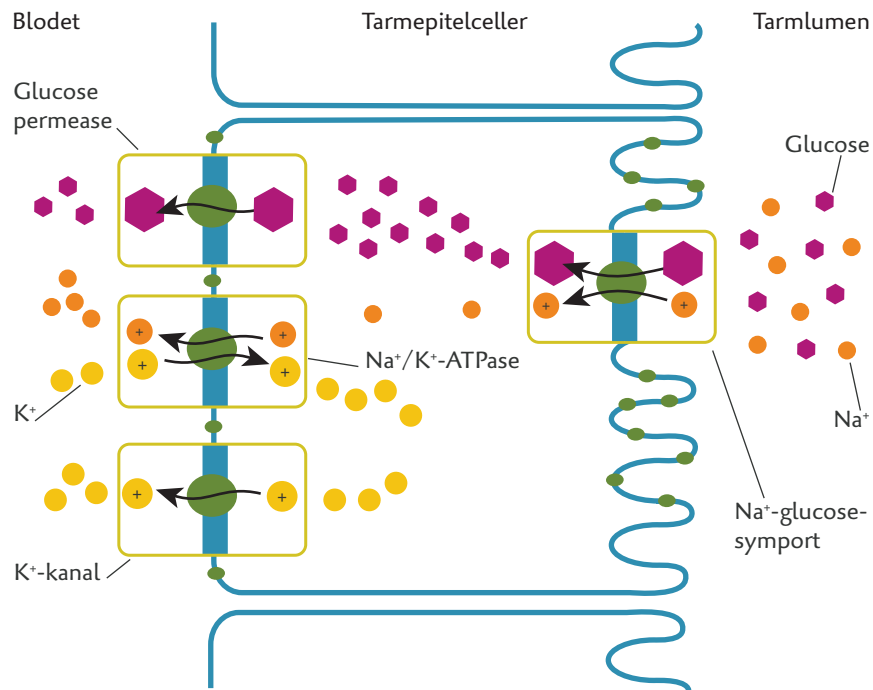
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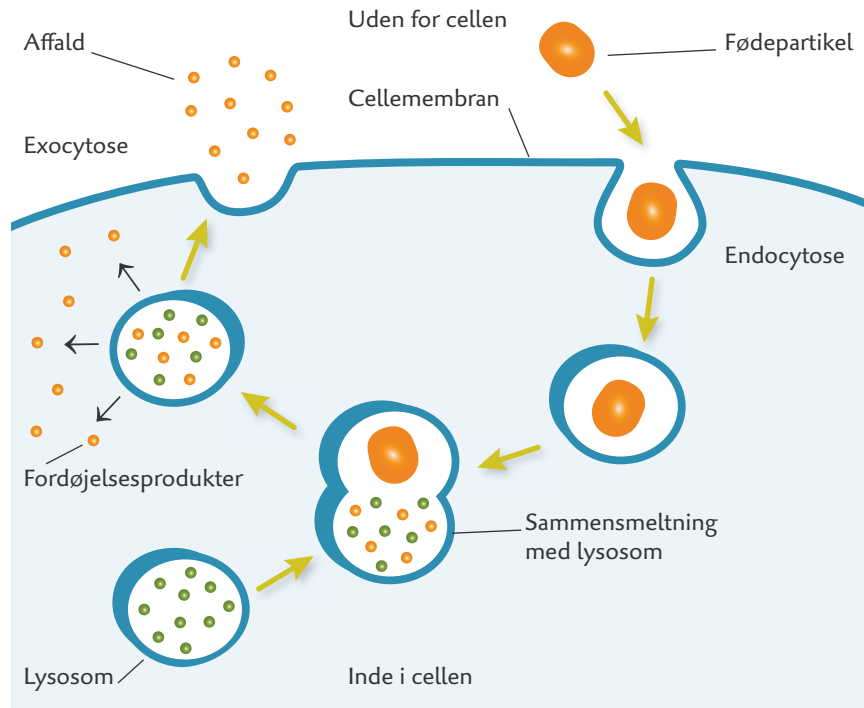
Figur 50. Na<sup>+</sup>/K<sup>+</sup>-pumpen.

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Figur 51. Eksempel på symport cotransport.  
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Figur 52. Endocytose og exocytose.

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a

	$C_6H_{12}O_6(aq)$	$2 C_2H_5OH(aq)$	$2 CO_2(g)$
Masse (g)	180,18		
Molarmasse (g/mol)	180,18	46,08	44,01
Stofmængde (mol)	1	2	2

b

	$C_6H_{12}O_6(aq)$	$2 C_2H_5OH(aq)$	$2 CO_2(g)$
Masse (g)	180,18	92,16	88,02
Molarmasse (g/mol)	180,18	46,08	44,01
Stofmængde (mol)	1	2	2

Figur 53 a. Beregning af massen af ethanol og carbondioxid.  
 b. Et mol glucose forgæres til to mol ethanol og carbondioxid.  
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