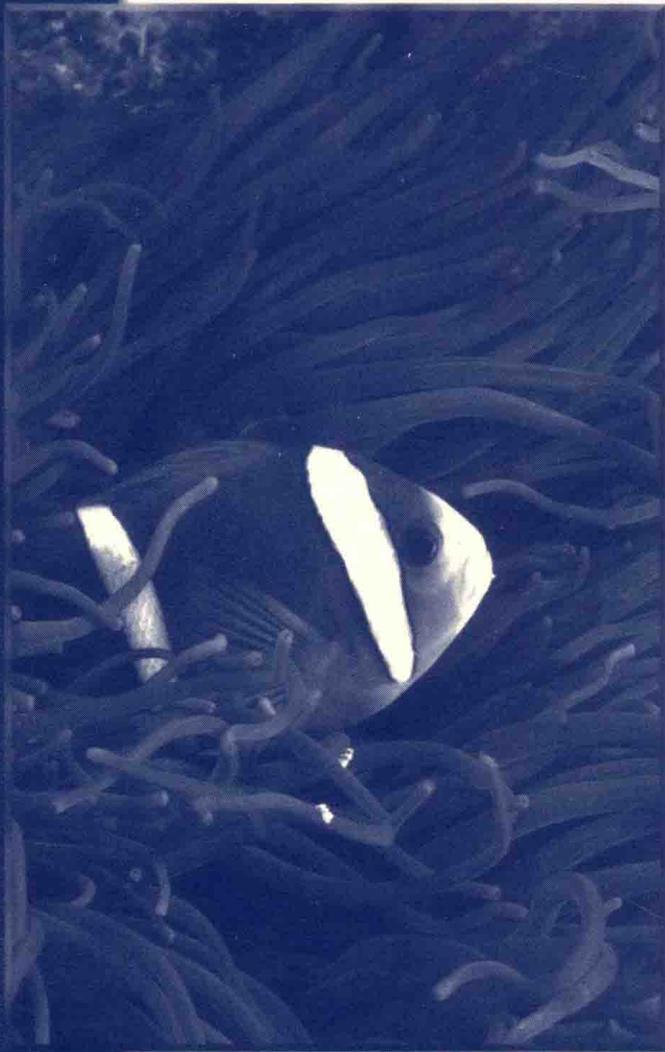


# Ready Notes

to accompany

FIFTH EDITION

# BIOLOGY



RAVEN  
JOHNSON

# Ready Notes

*to accompany*

# Biology

*Fifth Edition*

Peter H. Raven

*Washington University*

George B. Johnson

*Washington University*



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# Chapter 1

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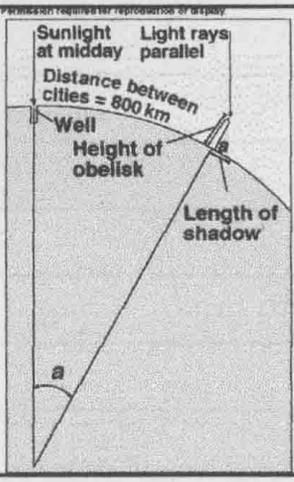
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### Deductive Reasoning: Estimating the Earth's Circumference



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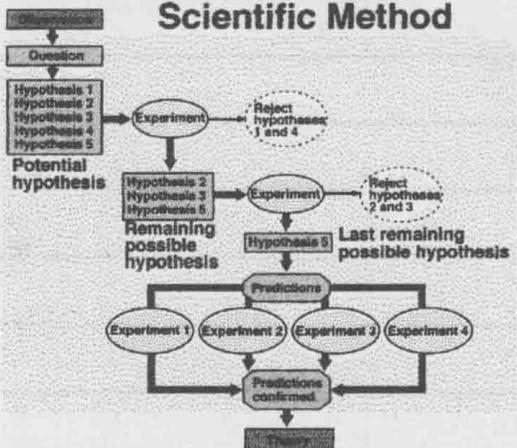
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### Scientific Method



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## H.M.S. *Beagle* Voyage



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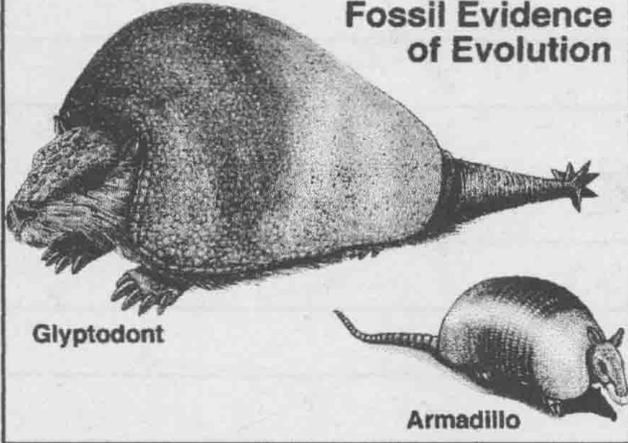
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## Fossil Evidence of Evolution



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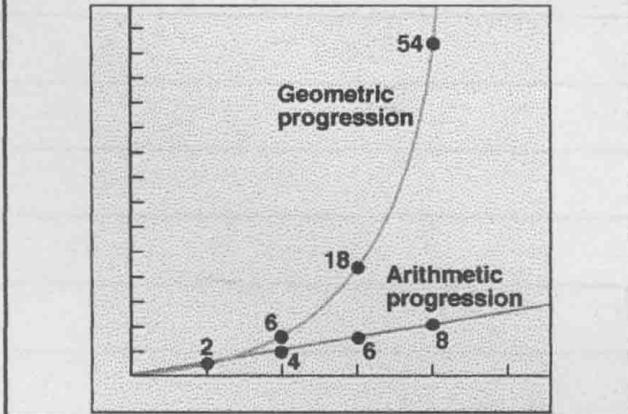
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## Geometric and Arithmetic Progressions



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# Chapter 2

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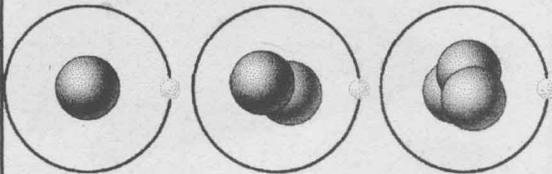
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### Atoms



Hydrogen (H)

Deuterium ( $^2\text{H}$ )

Tritium ( $^3\text{H}$ )

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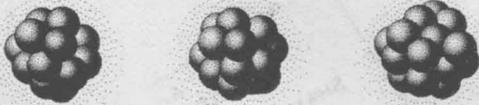
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### Carbon Isotopes



Carbon - 12  
6 Protons  
6 Neutrons  
6 Electrons

Carbon - 13  
6 Protons  
7 Neutrons  
6 Electrons

Carbon - 14  
6 Protons  
8 Neutrons  
6 Electrons

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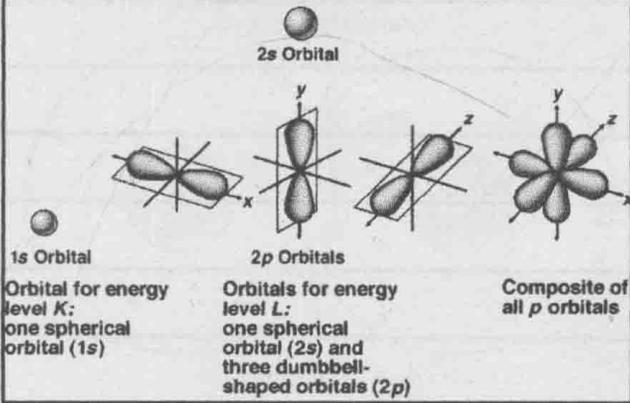
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### Electron Orbitals



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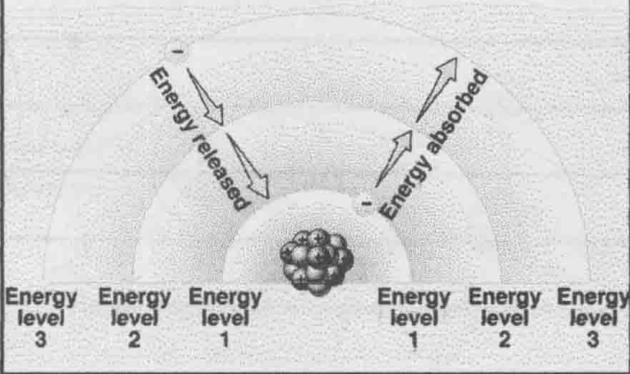
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### Atomic Energy Levels



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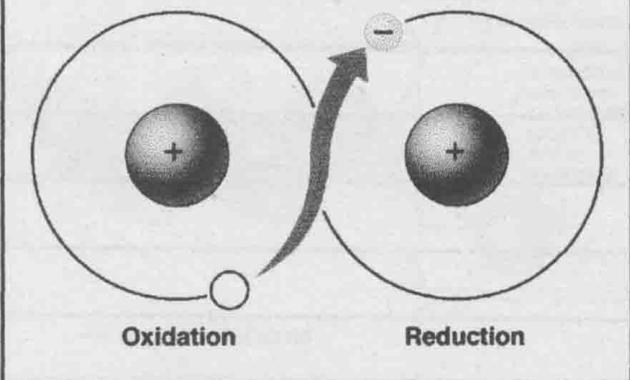
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### Oxidation and Reduction



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### Electron Energy Levels—Helium and Nitrogen

Helium Nitrogen

Nucleus

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### Periodic Table

|          |          |          |          |          |          |          |          |          |          |          |          |          |           |           |           |           |          |         |
|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|-----------|-----------|-----------|----------|---------|
| 1<br>H   |          |          |          |          |          |          |          |          |          |          |          |          |           |           |           |           | 8<br>O   | 2<br>He |
| 3<br>Li  | 4<br>Be  |          |          |          |          |          |          |          |          |          |          | 5<br>B   | 6<br>C    | 7<br>N    | 9<br>F    | 10<br>Ne  |          |         |
| 11<br>Na | 12<br>Mg |          |          |          |          |          |          |          |          |          |          | 13<br>Al | 14<br>Si  | 15<br>P   | 16<br>S   | 17<br>Cl  | 18<br>Ar |         |
| 19<br>K  | 20<br>Ca | 21<br>Sc | 22<br>Ti | 23<br>V  | 24<br>Cr | 25<br>Mn | 26<br>Fe | 27<br>Co | 28<br>Ni | 29<br>Cu | 30<br>Zn | 31<br>Ga | 32<br>Ge  | 33<br>As  | 34<br>Se  | 35<br>Br  | 36<br>Kr |         |
| 37<br>Rb | 38<br>Sr | 39<br>Y  | 40<br>Zr | 41<br>Nb | 42<br>Mo | 43<br>Tc | 44<br>Ru | 45<br>Rh | 46<br>Pd | 47<br>Ag | 48<br>Cd | 49<br>In | 50<br>Sn  | 51<br>Sb  | 52<br>Te  | 53<br>I   | 54<br>Xe |         |
| 55<br>Cs | 56<br>Ba | 57<br>La | 58<br>Ce | 59<br>Pr | 60<br>Nd | 61<br>Pm | 62<br>Sm | 63<br>Eu | 64<br>Gd | 65<br>Tb | 66<br>Dy | 67<br>Ho | 68<br>Er  | 69<br>Tm  | 70<br>Yb  | 71<br>Lu  |          |         |
| 87<br>Fr | 88<br>Ra | 89<br>Ac | 90<br>Th | 91<br>Pa | 92<br>U  | 93<br>Np | 94<br>Pu | 95<br>Am | 96<br>Cm | 97<br>Bk | 98<br>Cf | 99<br>Es | 100<br>Fm | 101<br>Md | 102<br>No | 103<br>Lr |          |         |

(Lanthanide series) Ce Pr Nd Pm Sm Eu Gd Tb Dy Ho Er Tm Yb Lu

(Actinide series) Th Pa U Np Pu Am Cm Bk Cf Es Fm Md No Lr

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### Ionic Bonds—NaCl

Sodium atom Chlorine atom

+ Sodium ion - Chloride ion

NaCl crystal

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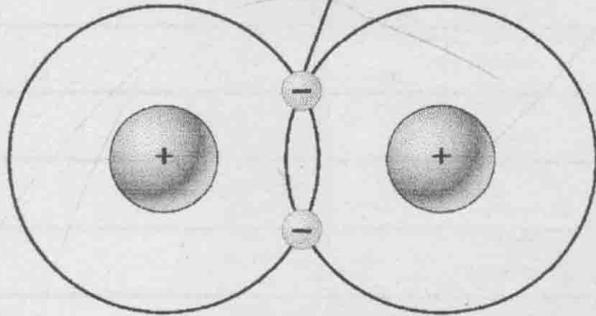
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### Covalent Bond

Covalent Bond



H<sub>2</sub>(hydrogen gas)

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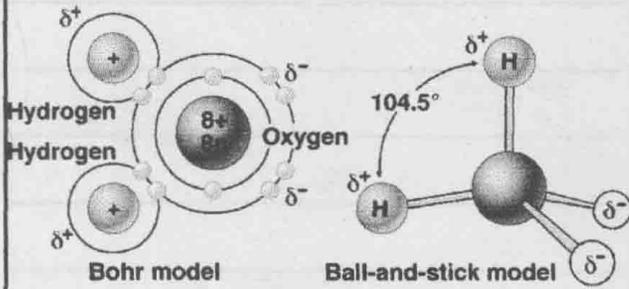
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### Molecular Structure of Water



Bohr model

Ball-and-stick model

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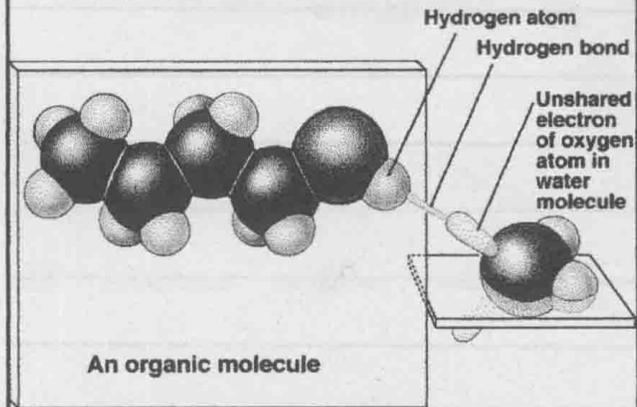
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### Hydrogen Bond Structure



An organic molecule

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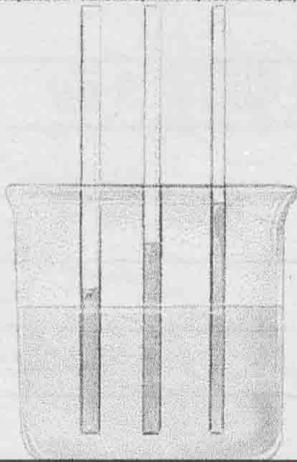
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### Capillary Action



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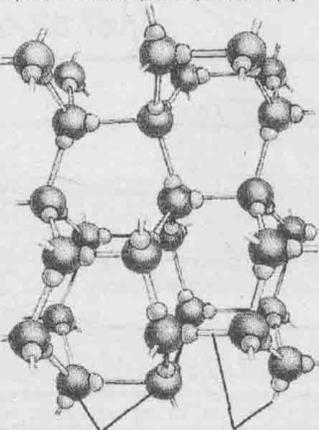
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### Hydrogen Bonds in an Ice Crystal



Water molecules      Hydrogen bonds

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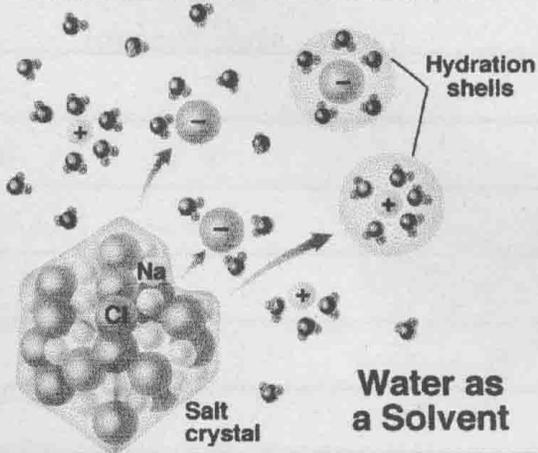
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Water as a Solvent

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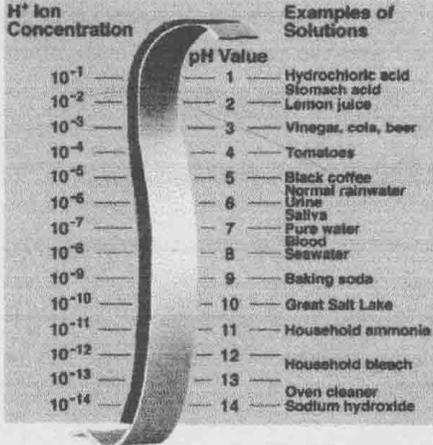
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## pH Scale



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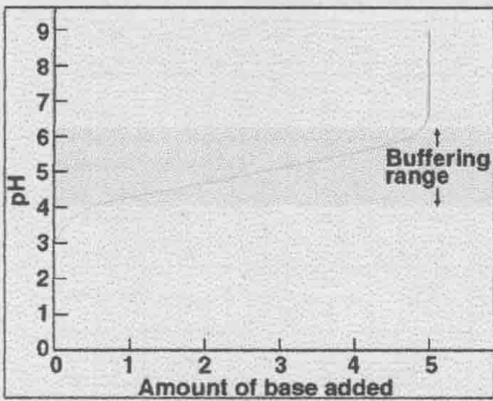
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## Relationship of pH and Buffers



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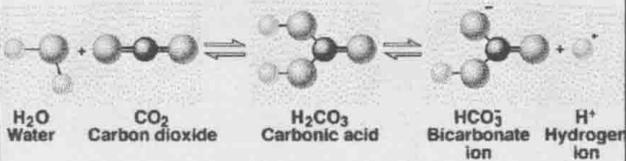
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## Buffer Formation



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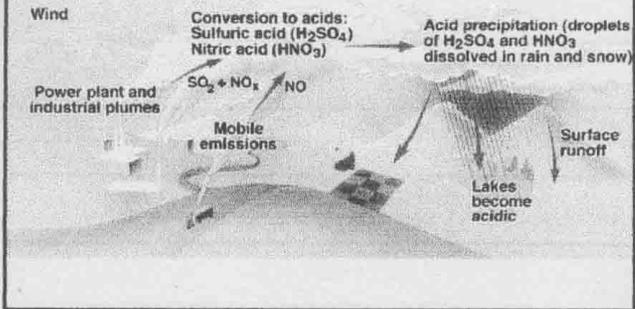
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## Formation of Acid Precipitation



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# Chapter 3

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### Primary Functional Groups

| Group      | Chemical formula | Structural Formula | Ball-and-Stick Model | Found in:    |
|------------|------------------|--------------------|----------------------|--------------|
| Hydroxyl   | -OH              | -OH                | O-H                  | Alcohols     |
| Carbonyl   | C=O              |                    |                      | Formaldehyde |
| Carboxyl   | -COOH            |                    |                      | Vinegar      |
| Amino      | -NH <sub>2</sub> |                    |                      | Ammonia      |
| Sulfhydryl | -SH              | -S-H               | S-H                  | Rubber       |
| Phosphate  | -PO <sub>4</sub> |                    |                      | ATP          |
| Methyl     | -CH <sub>3</sub> |                    |                      | Methane gas  |

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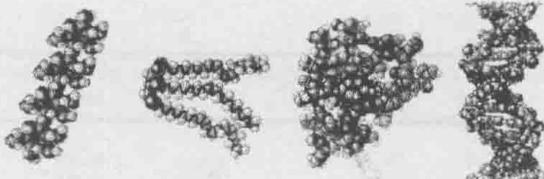
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### Biological Macromolecules



Carbohydrate  
(starch)

Lipid  
(triacylglycerol)

Protein  
(enzyme)

Nucleic acid  
(DNA)

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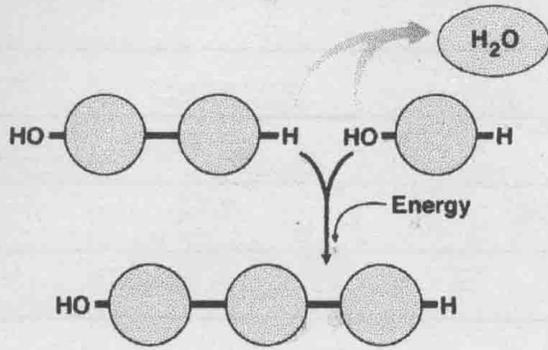
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## Dehydration Synthesis



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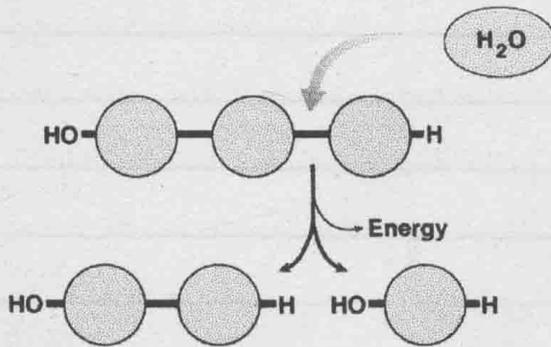
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## Hydrolysis



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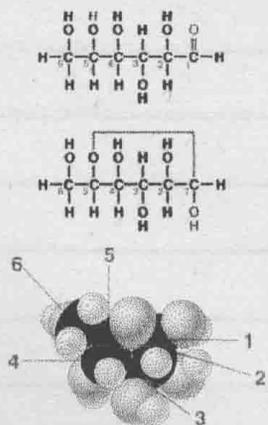
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## Glucose Molecular Structure (1)



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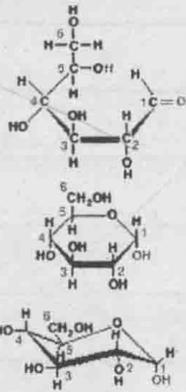
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## Glucose Molecular Structure (2)




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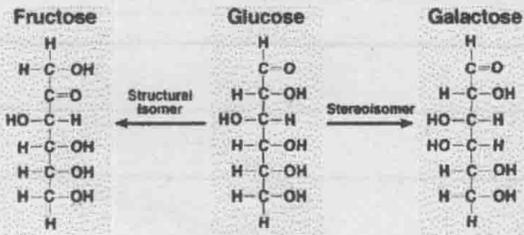
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## Isomers and Stereoisomers




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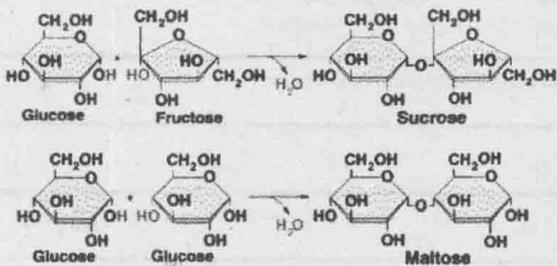
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## Disaccharides




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