

Solutions

Chapters 5 and 6

Dipole Interactions and H-bonding

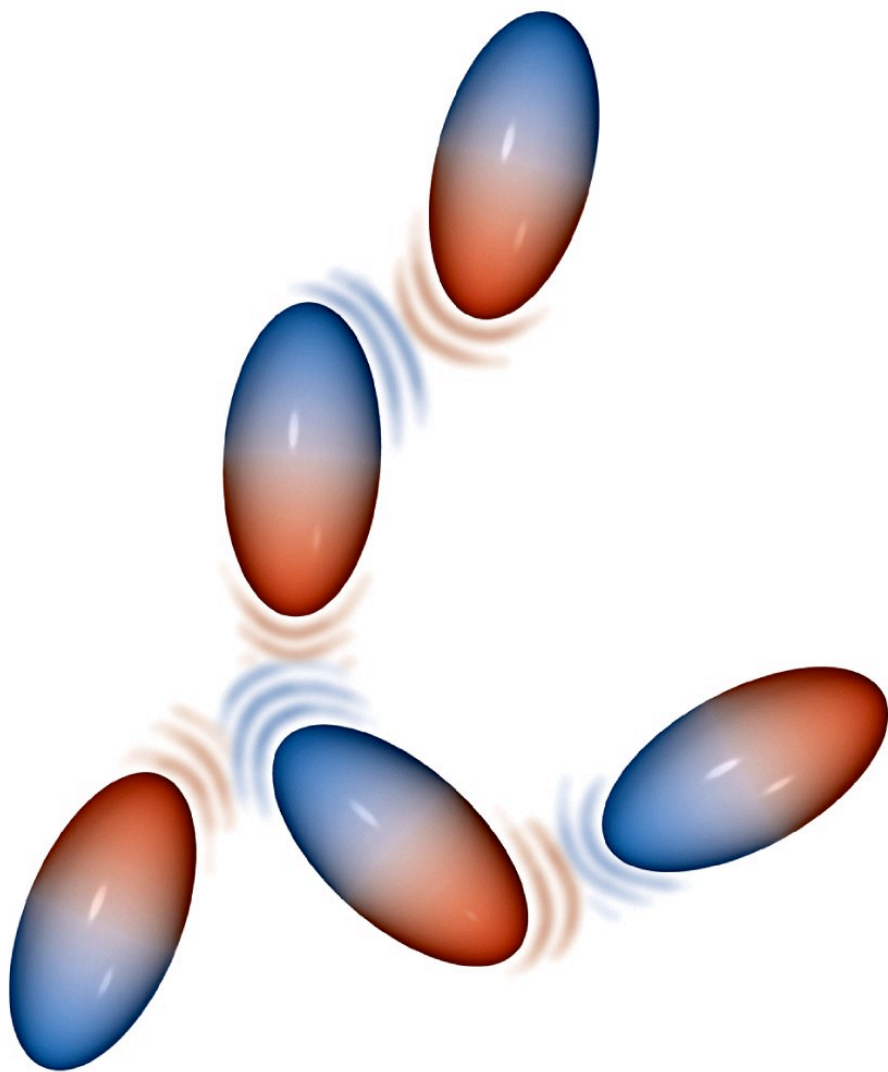


Figure 6-4
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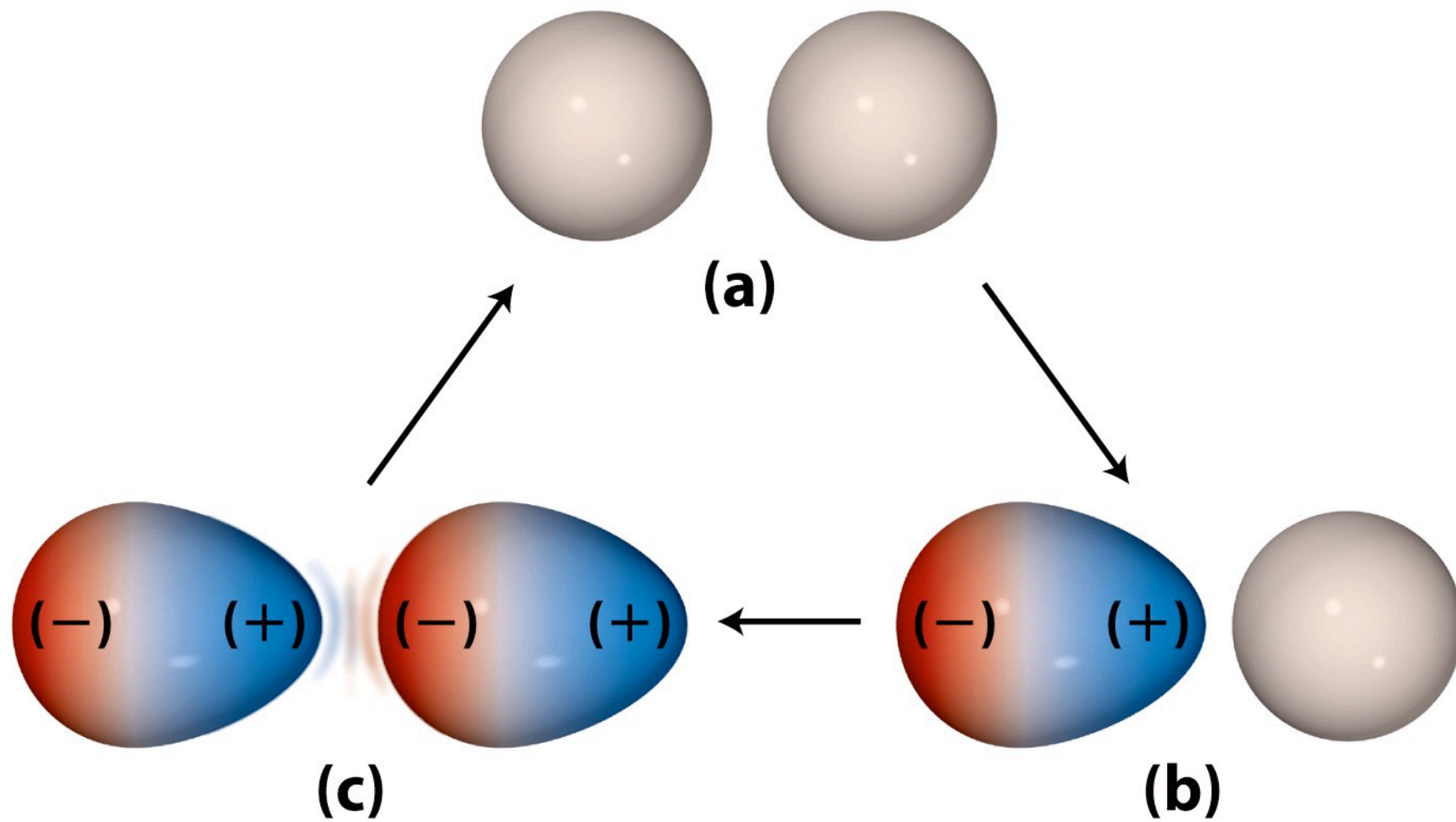
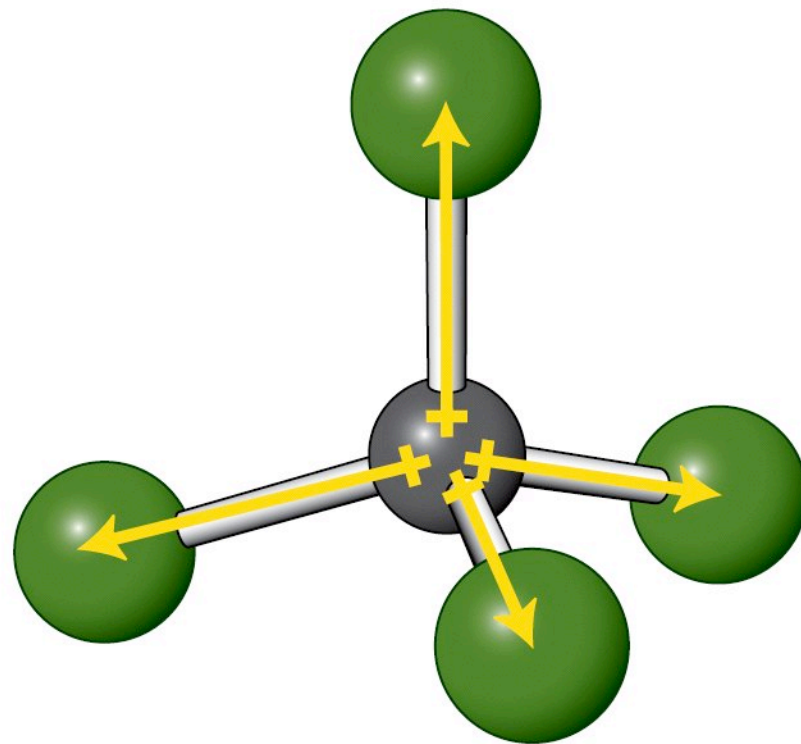


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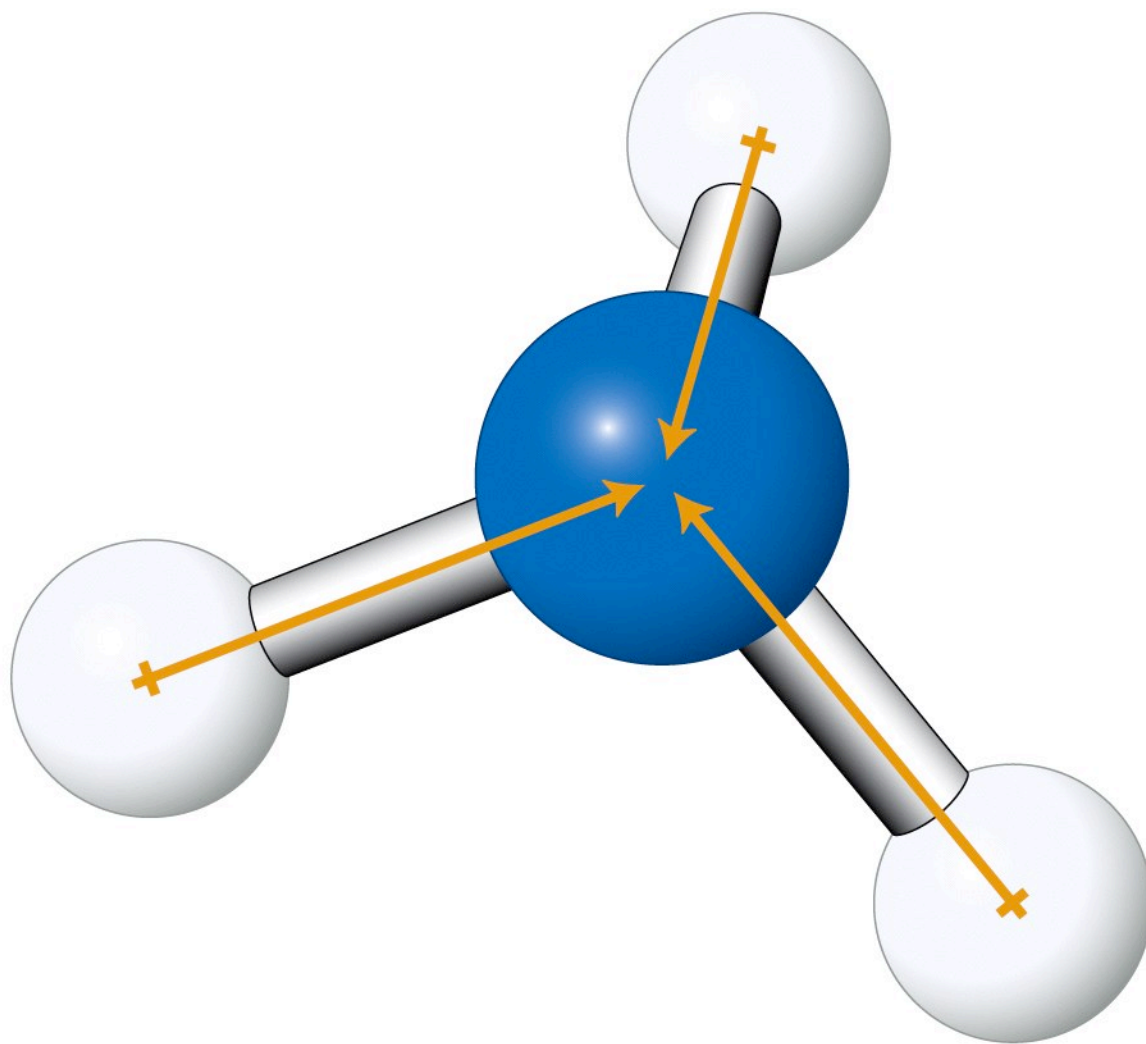


(a)



(b)

Figure 8-10
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Ammonia

Unnumbered figure pg 253
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Table 8.1 Electronegativity of the Nonmetal Elements

Element	Relative Electronegativity
Fluorine	4.0
Oxygen	3.5
Chlorine	3.0
Nitrogen	3.0
Bromine	2.8
Carbon	2.5
Sulfur	2.5
Iodine	2.5
Selenium	2.4
Hydrogen	2.1
Phosphorus	2.1

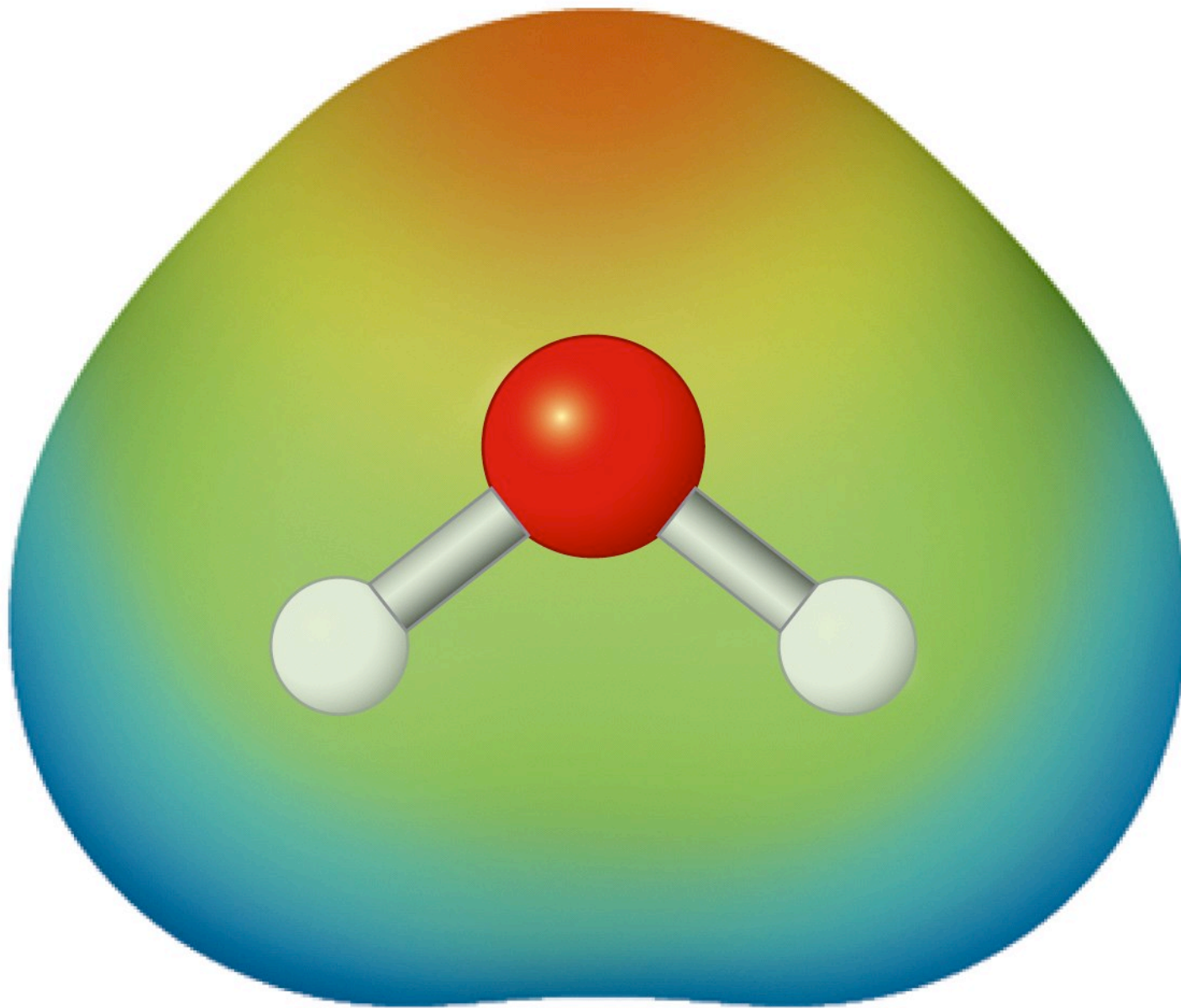
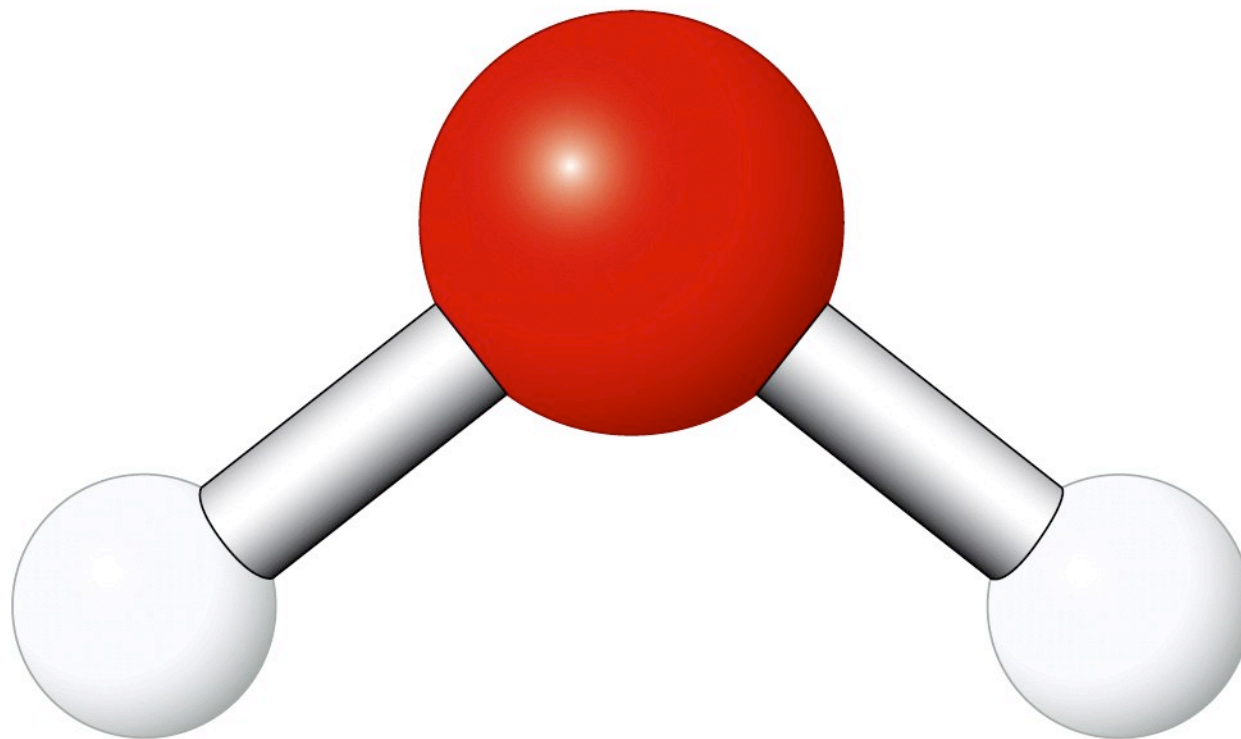


Figure 5-1
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Water (H₂O) has a bent molecular geometry.

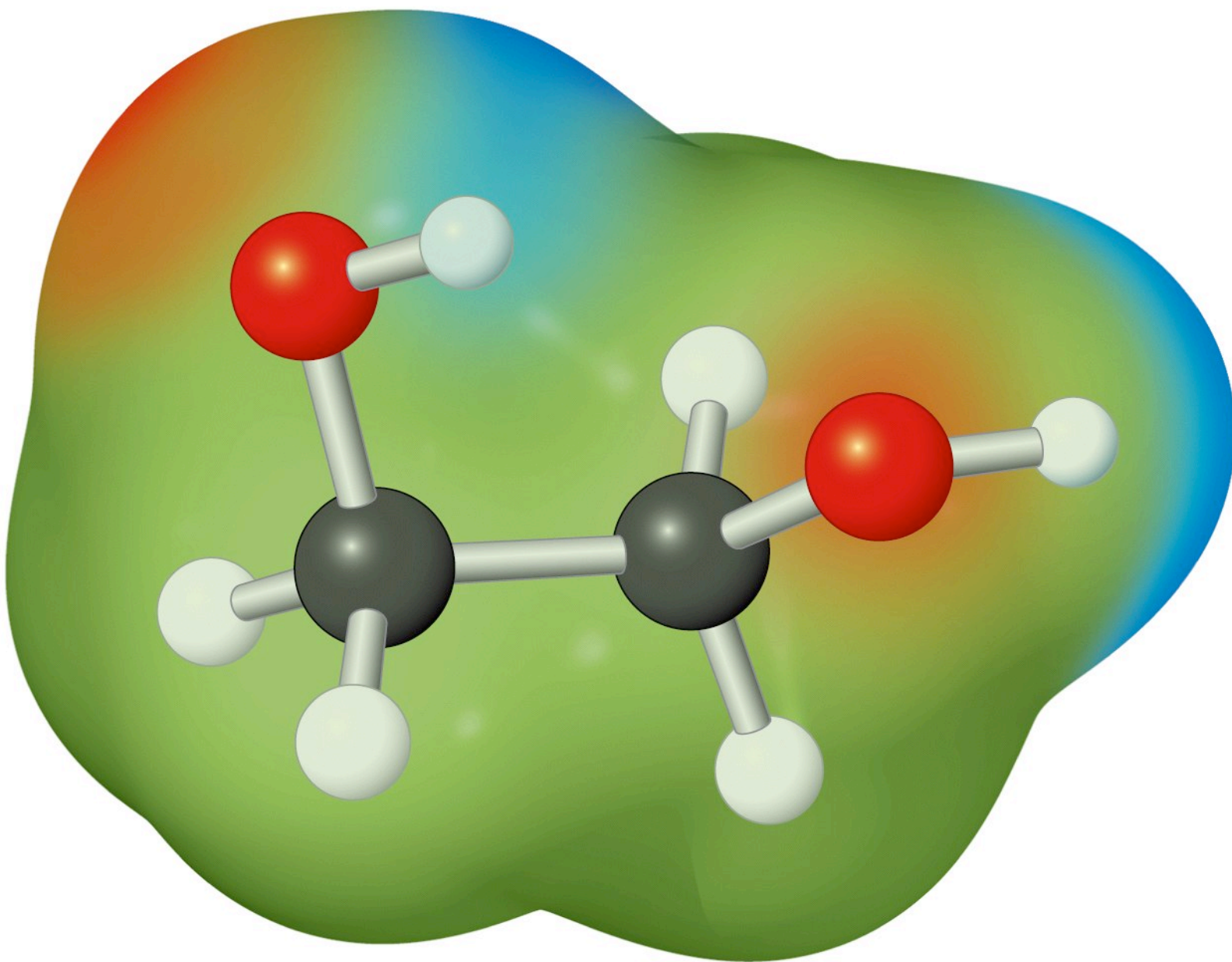
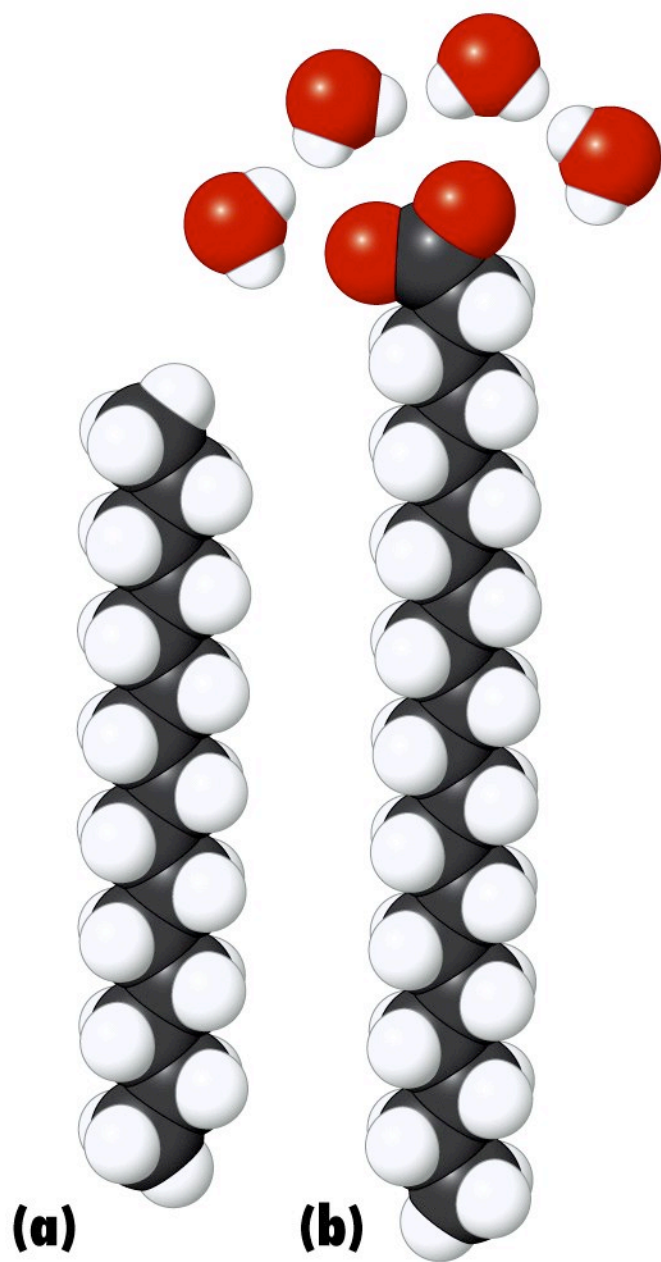


Figure 5-3
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(a) **(b)**
Figure 5-9
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Diz-Files: Discrepant and Bizarre

RetroJunk.com

Real life **IS** stranger than fiction!!

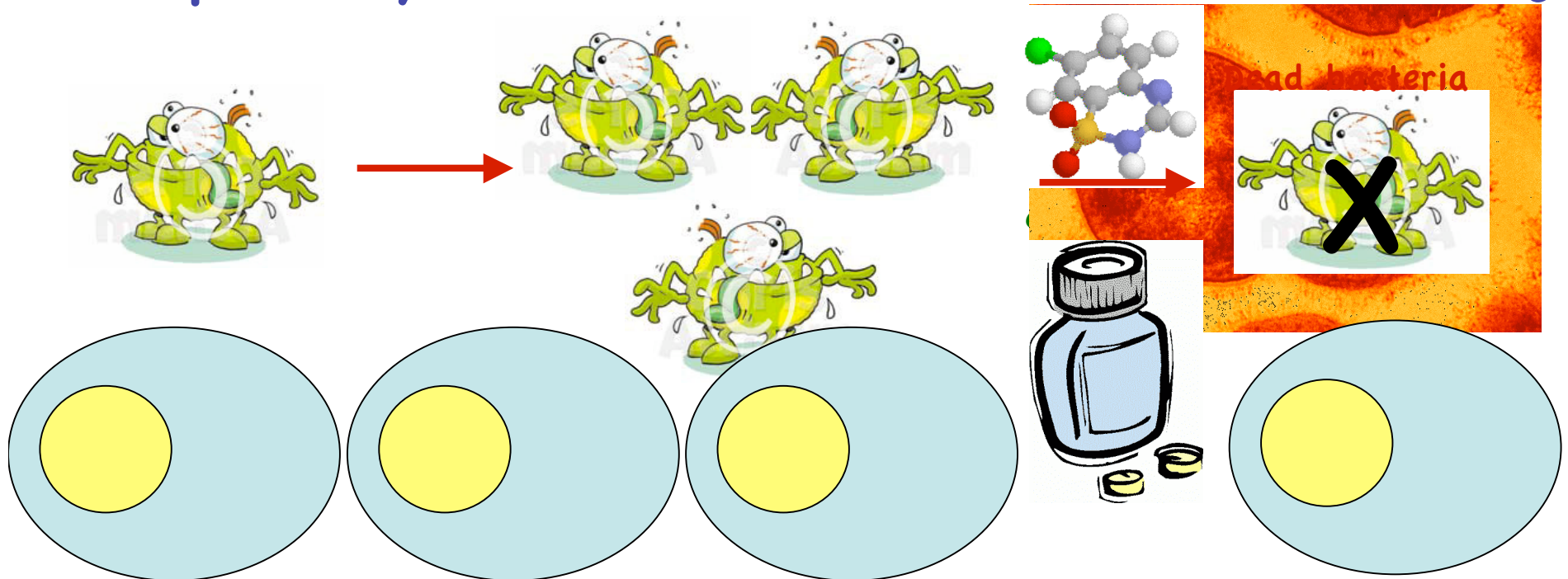
How do germs make us sick?

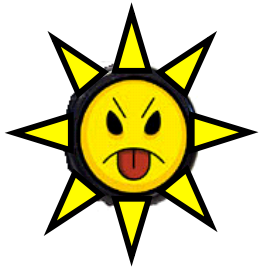


Two kinds: **bacteria** and **viruses**

Bacteria make us sick by invading
and growing in our tissues

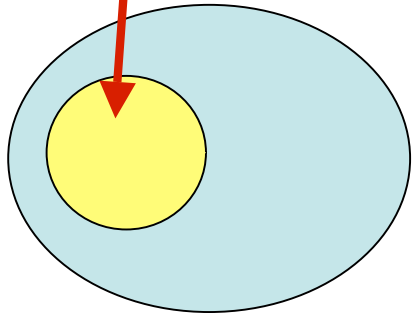
especially noses, throats, stomachs and lungs



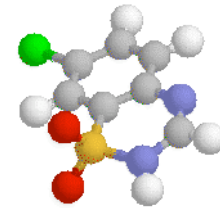
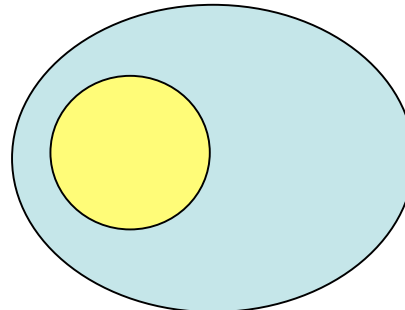
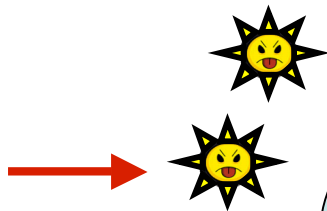
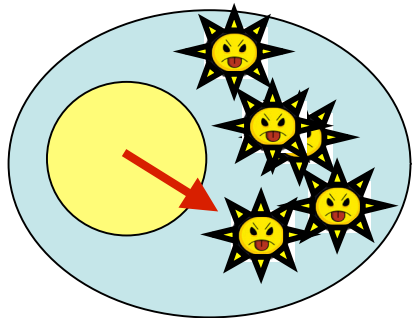


Viruses are **AMAZING** but different

Viruses actually go into our cells and put their directions for making baby viruses into our DNA.

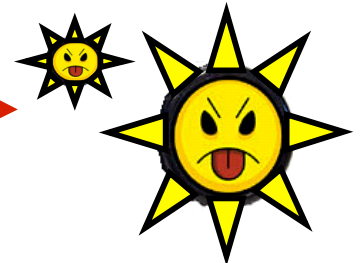


They force our cells to make tons of baby viruses that infect other cells

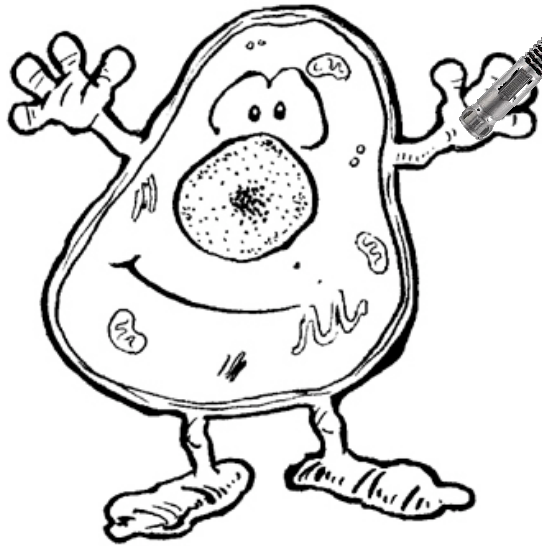


antibiotics

Dont work!!



THE PLAYERS:



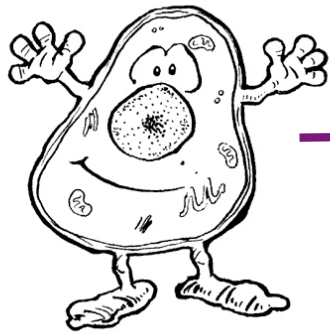
**BCELL
KANOBİ**



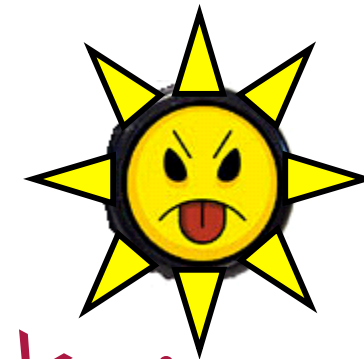
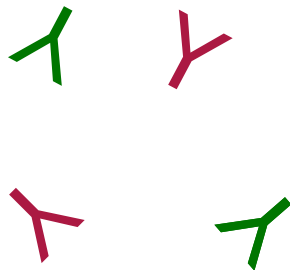
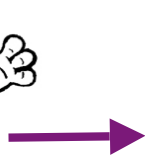
**DARTH BACTERIA
OR
DARTH VIRUS**

Antibodies are proteins that help us fight off bacteria and viruses that make us sick

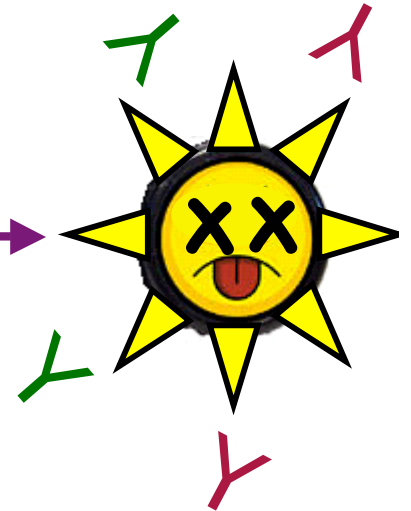
They are shaped like Ys.



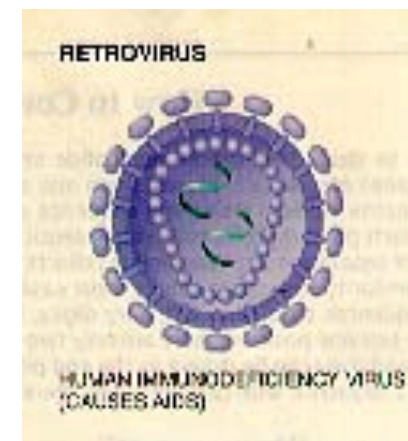
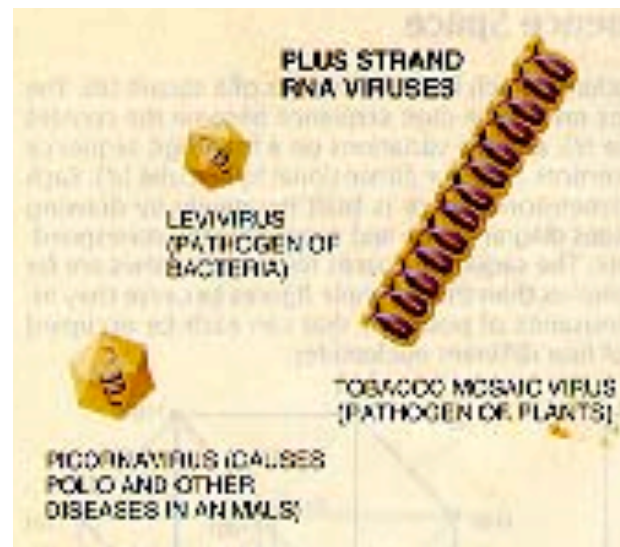
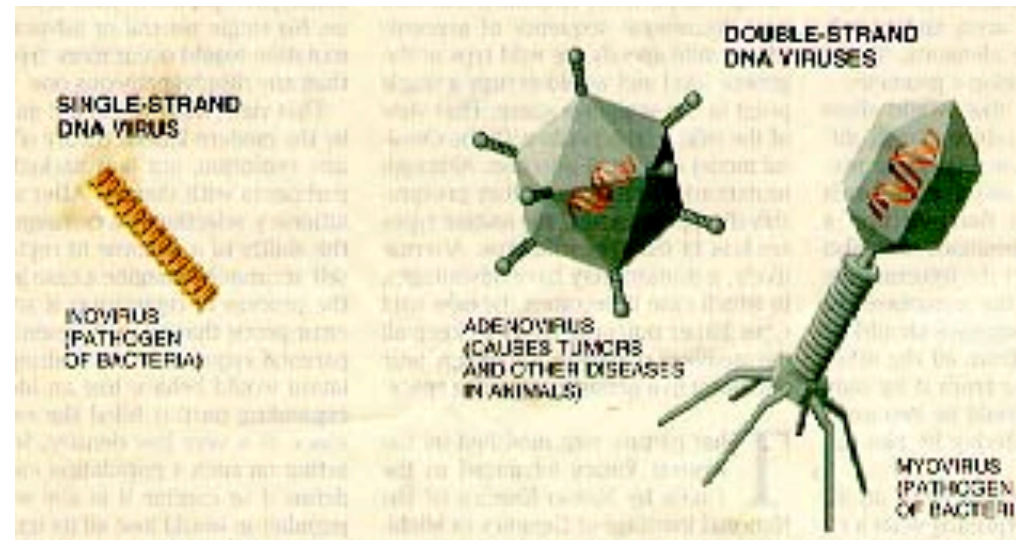
B cell



virus
or
bacteria

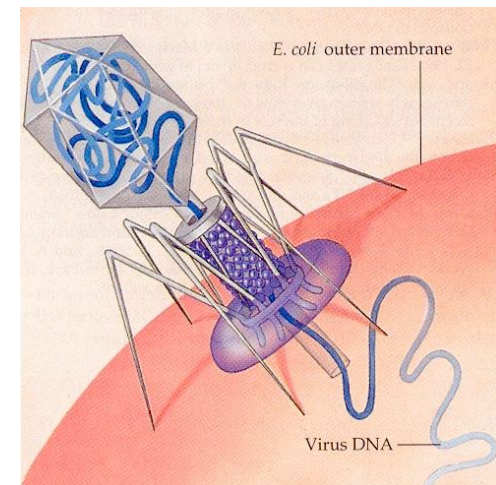
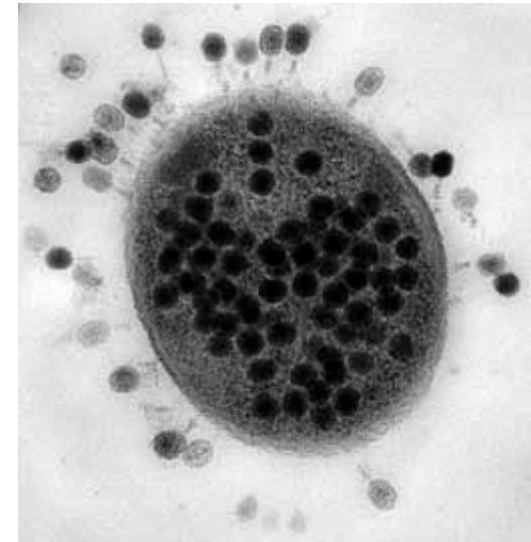
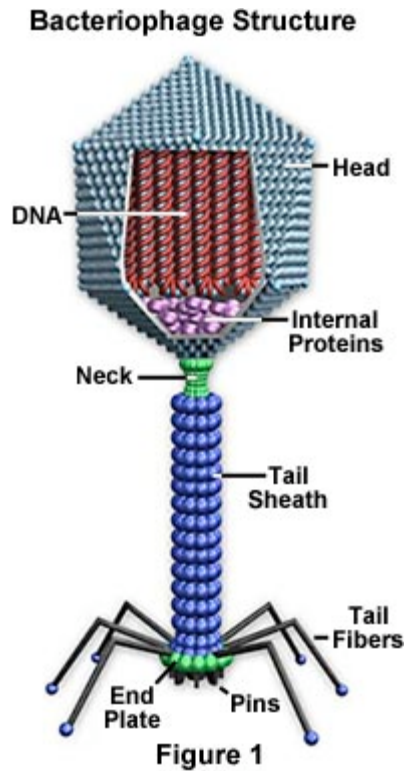


VIRUSES AREN'T REALLY SHAPED LIKE DARTHVIRUS



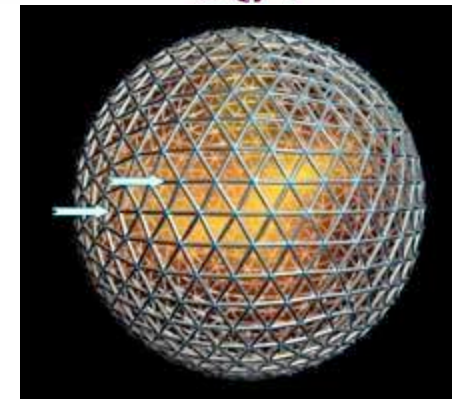
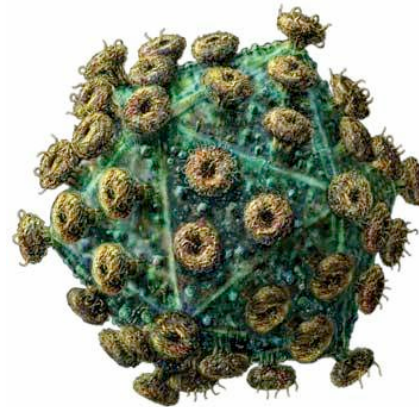
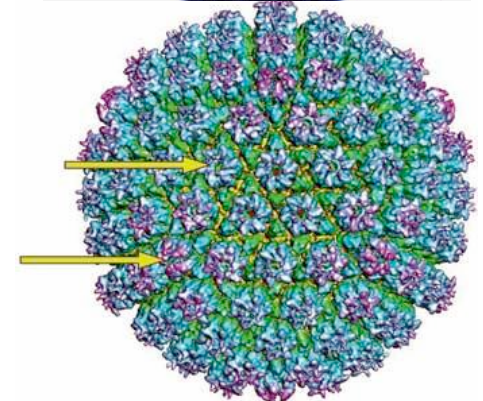
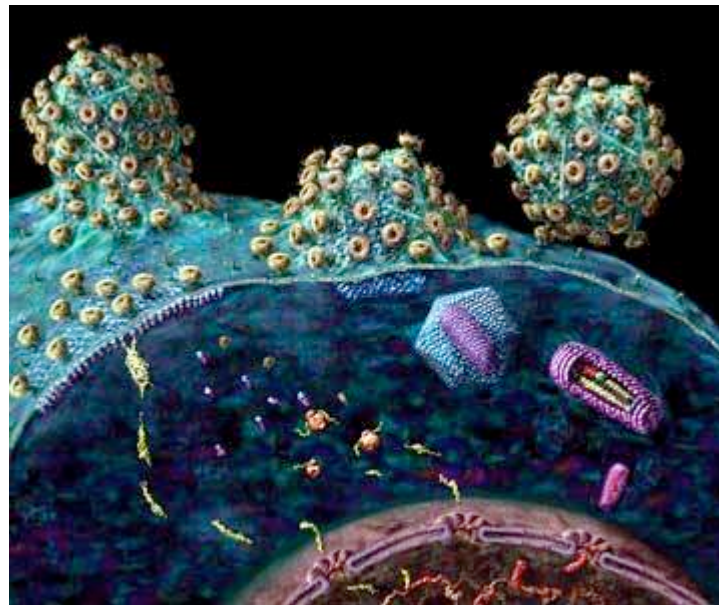
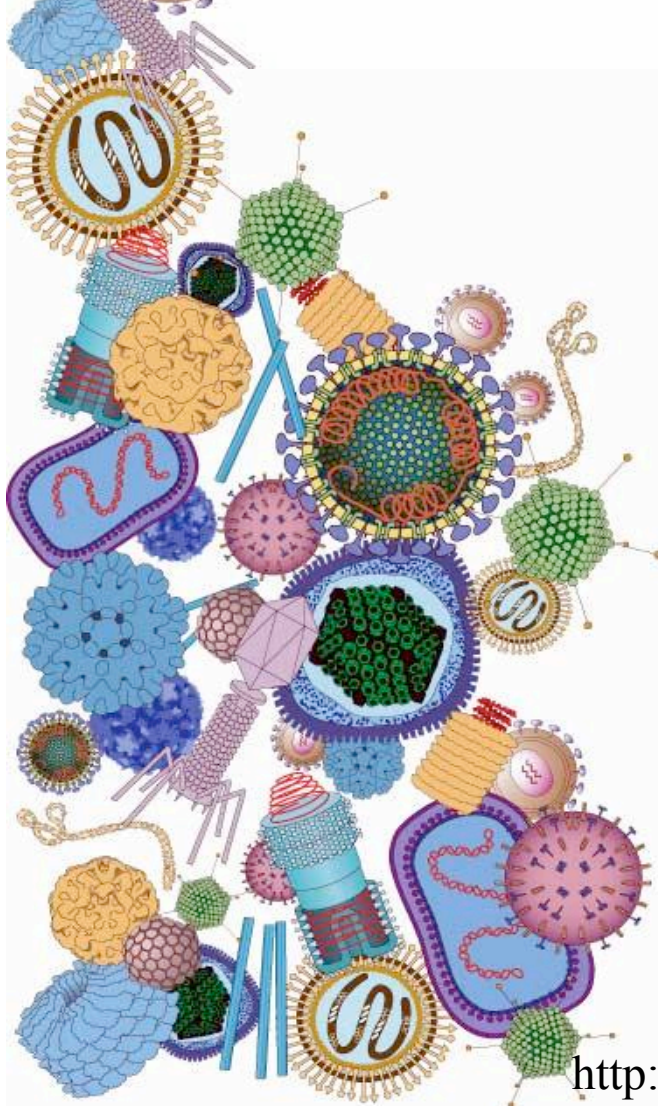
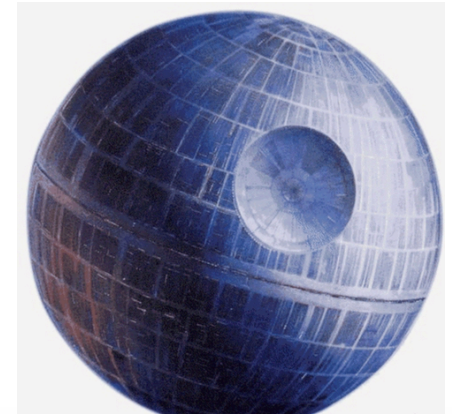
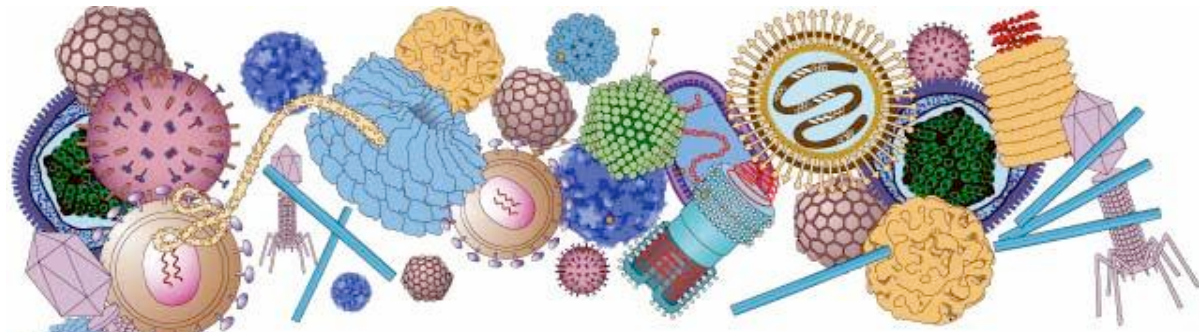
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THE COOLEST VIRUS EVER!



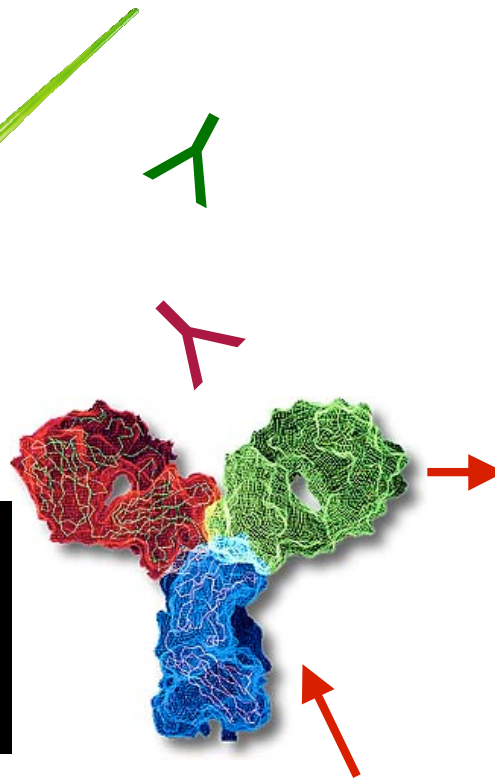
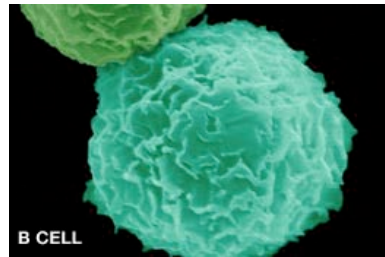
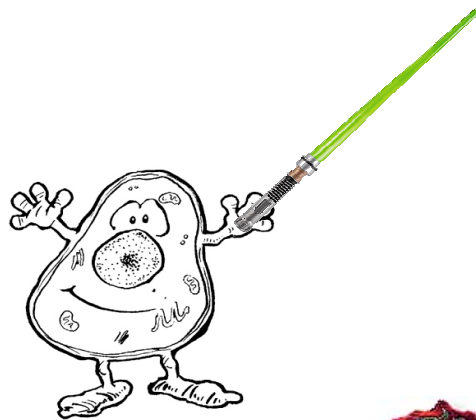
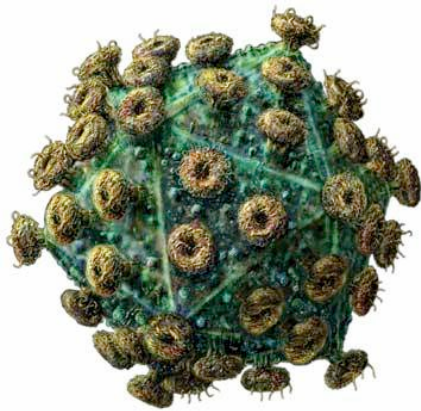
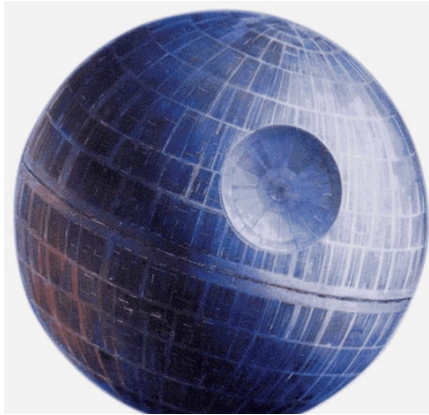
<http://www.vet.upenn.edu/schoolresources>
http://www.microbeworld.org/img/aboutmicro/gallery/gid_07_t4.jpg
<http://www.yildizindunyasi.net/photogallery/bacteriophage.jpg>
http://www.nature.com/news/2003/031013/images/bacteriophage_180.jpg

HIV



<http://pr.caltech.edu/periodicals/EandS/photos/LXII1/hivlifecycle.jpg>

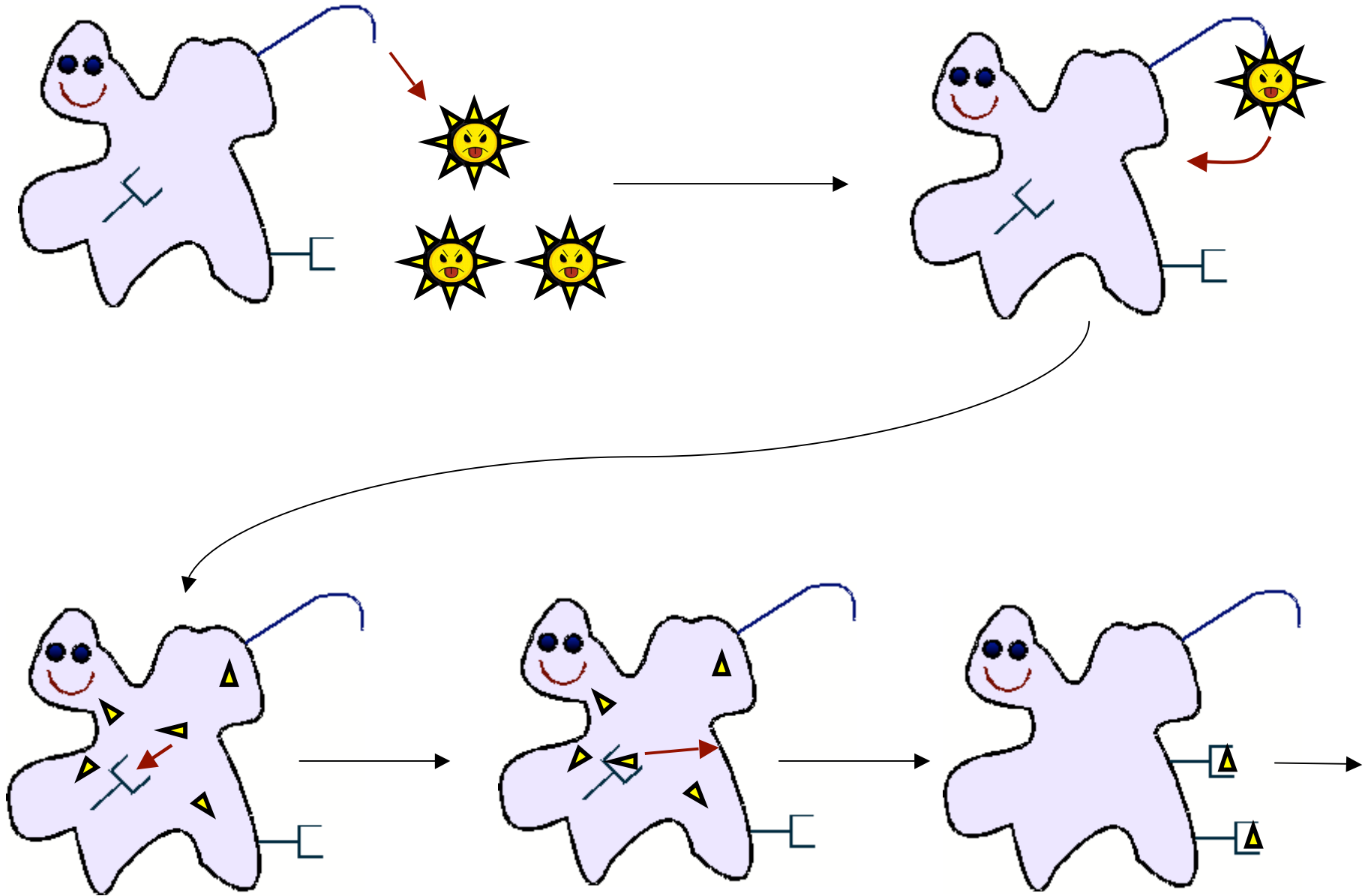
Hmmmm...



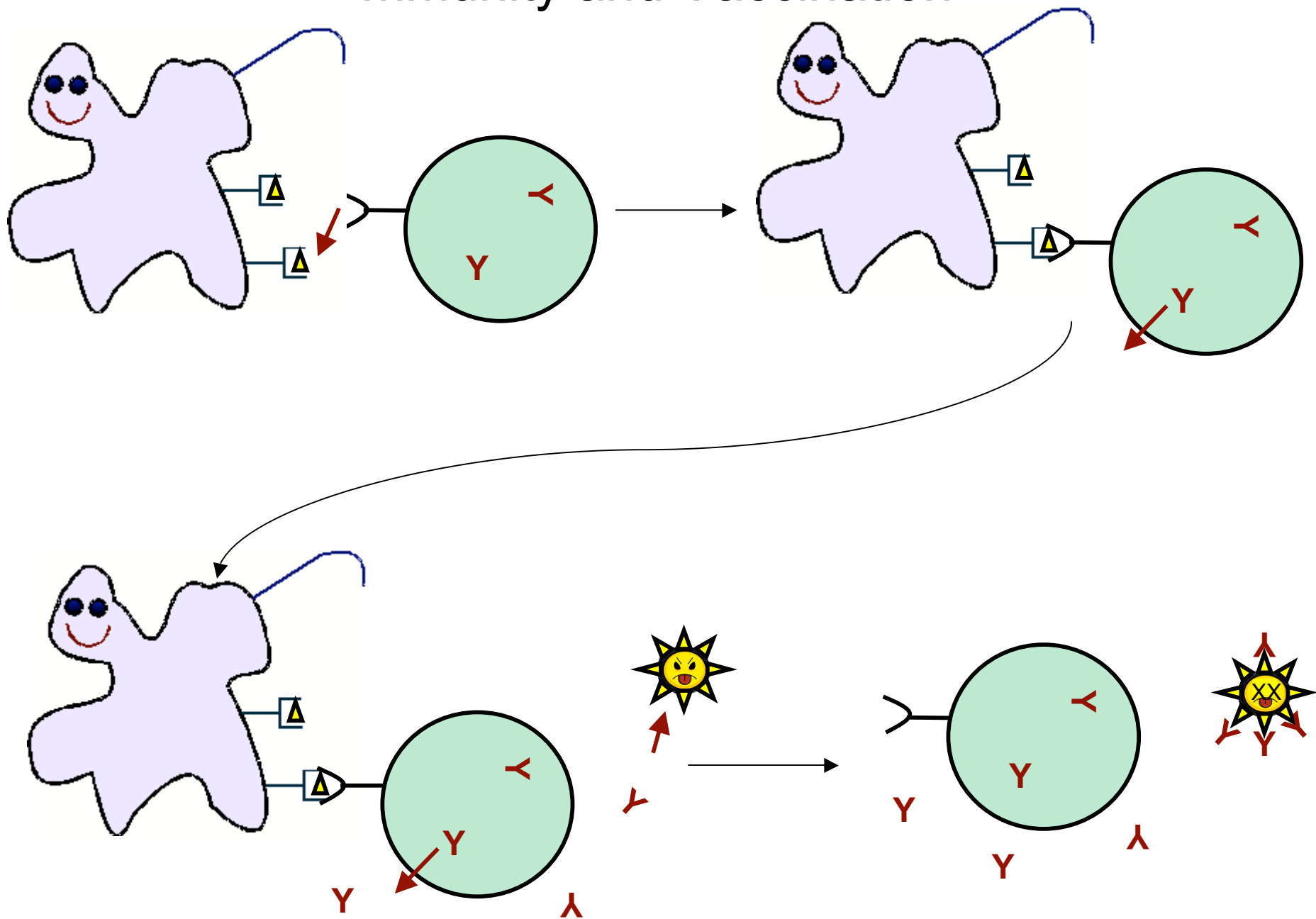
Real antibody



Immunity and Vaccination



Immunity and Vaccination



Immunity and Vaccination

Vaccinations contain
Weakened or dead viruses
or
Virus parts

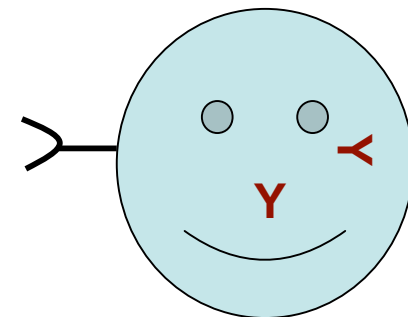


Immune system responds

B-cells make antibodies

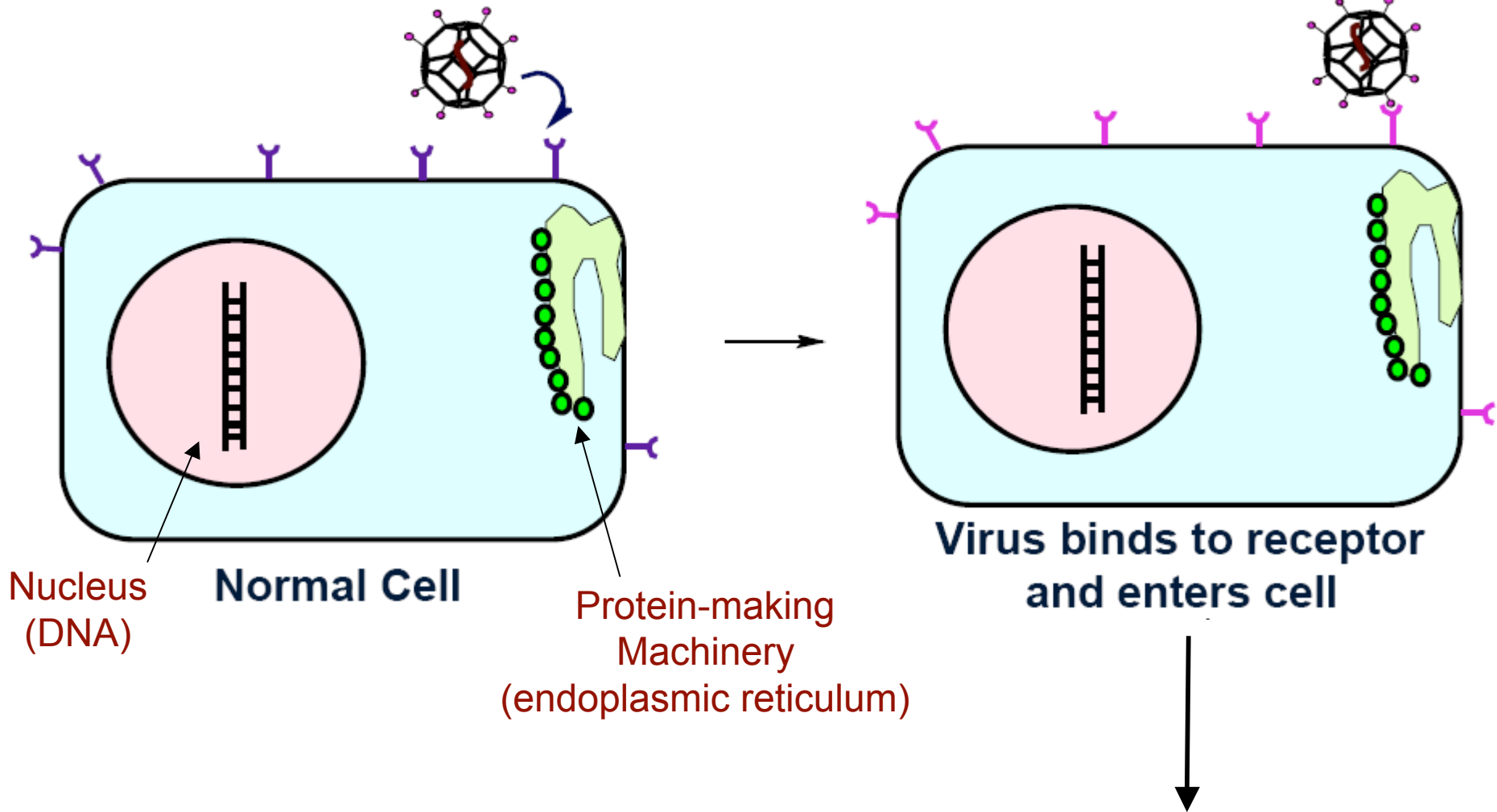
Become memory B-cells

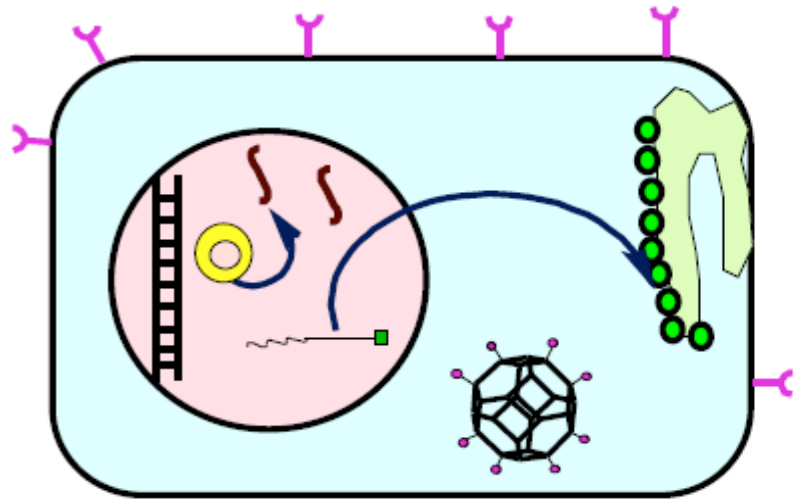
Memory B-cell



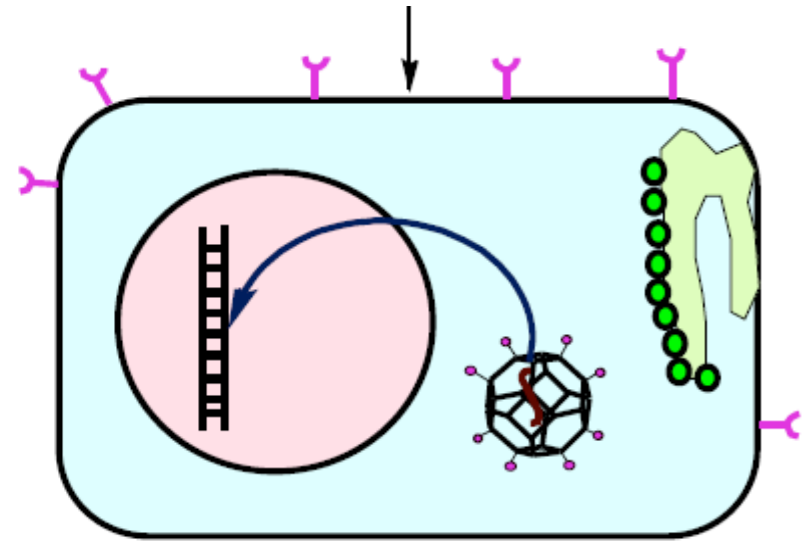


Human Immunodeficiency Virus (HIV)

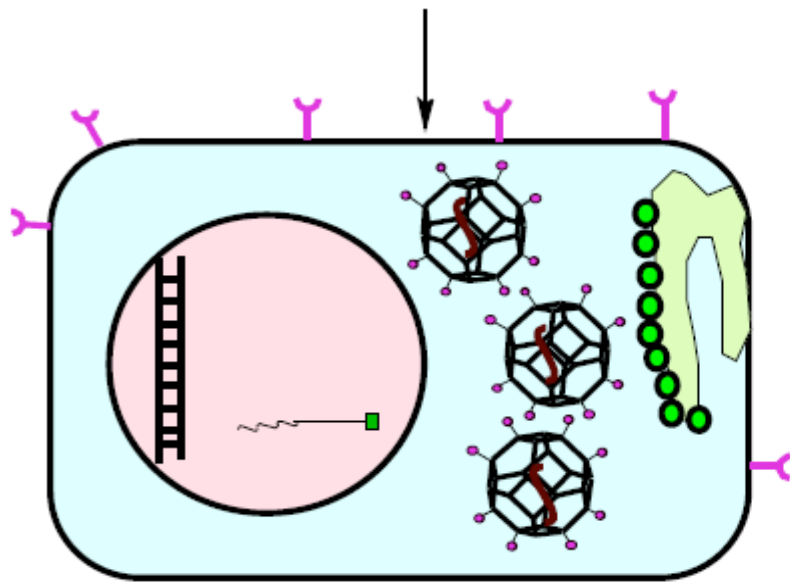




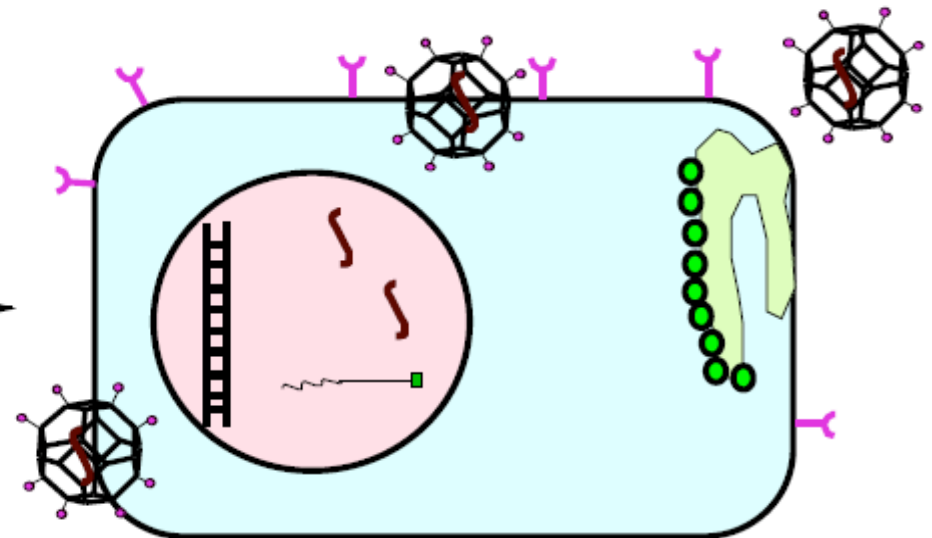
Virus makes copies of its RNA and makes viral proteins



RT copies RNA to DNA then DNA is inserted into host cell's DNA

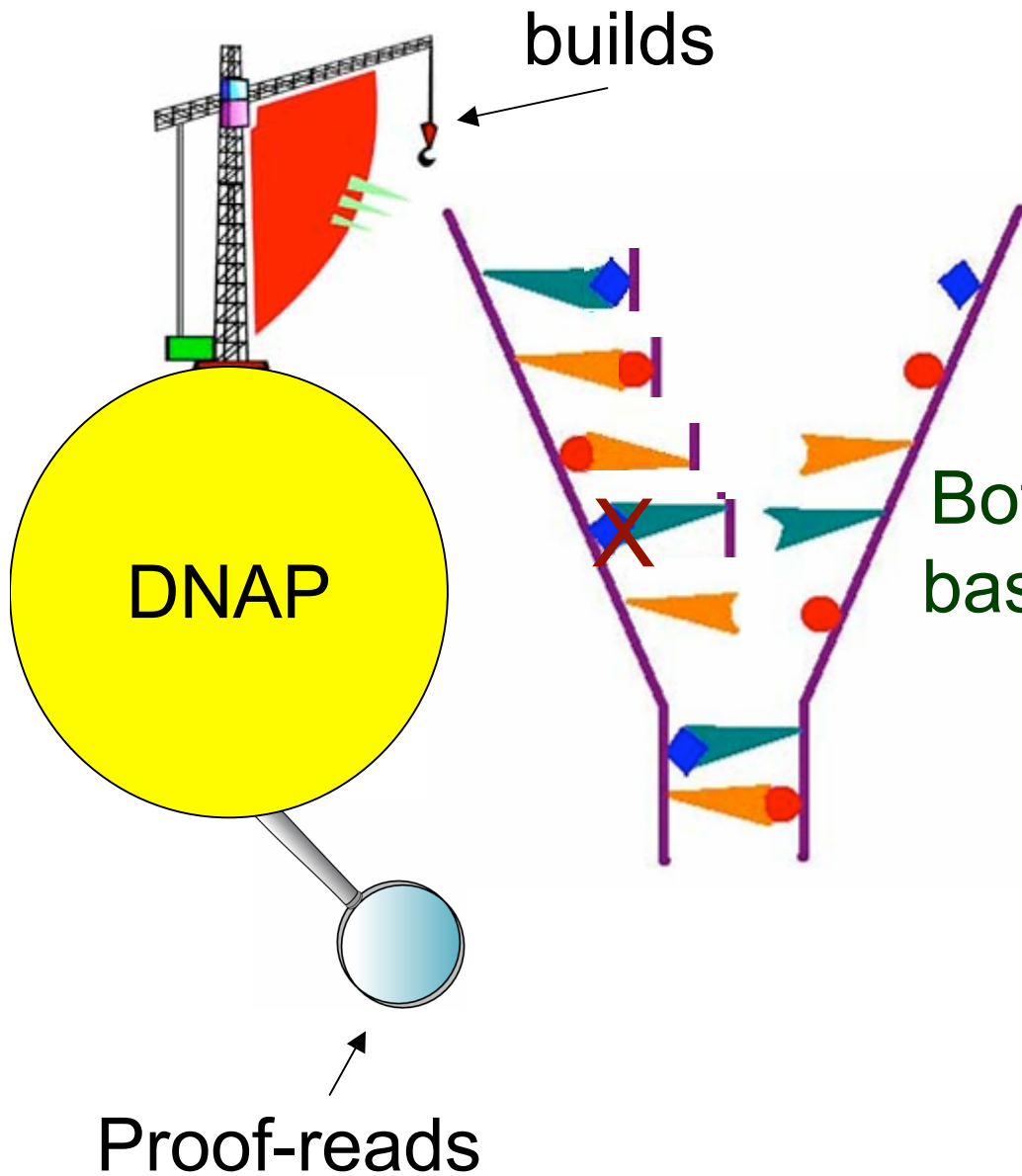


New progeny viruses are assembled



Progeny viruses are released into cytoplasm

Human DNA Replication



Our cells copy their DNA using an enzyme called DNA polymerase (DNAP)

Both builds DNA by putting in bases that match each strand
Thereby making a copy

Also proof-reads each copied base to make sure it is right

Makes DNA copy highly accurate

HIV DNA Replication

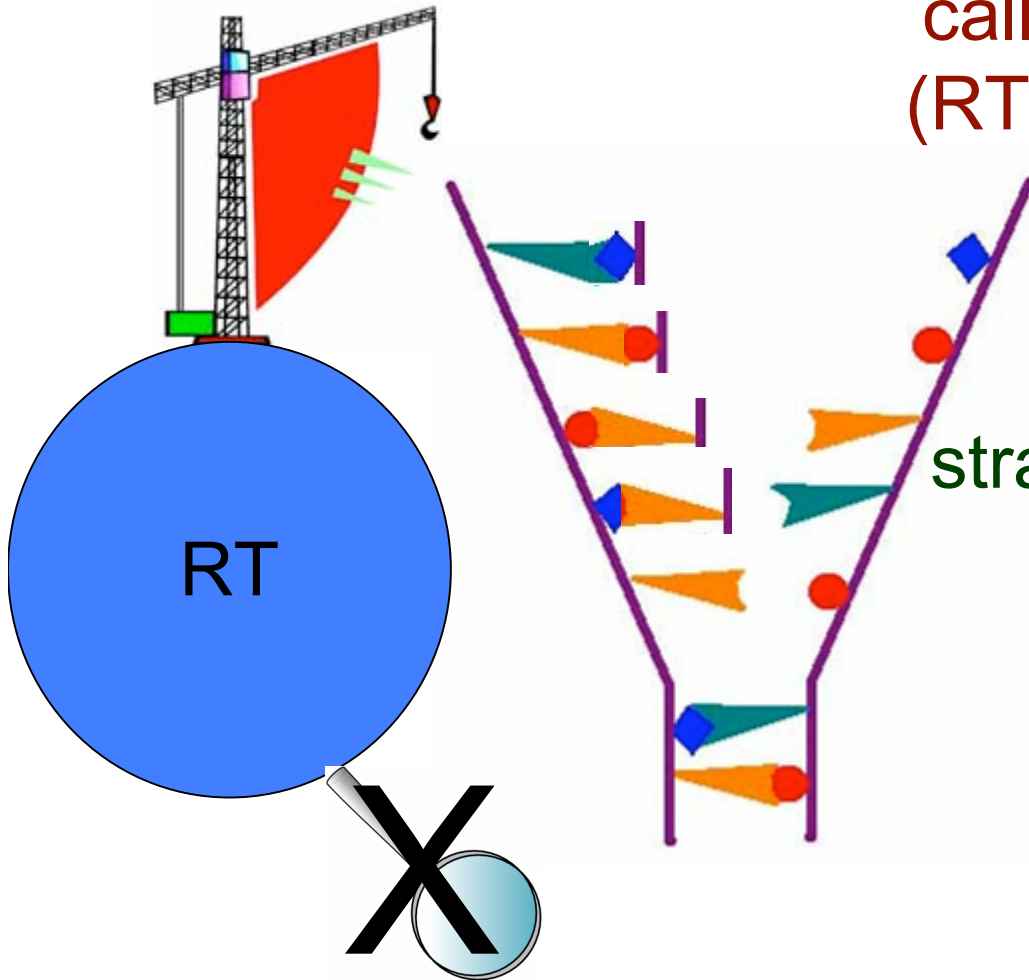


Viruses use an enzyme called Reverse Transcriptase (RT) to copy its RNA into DNA

Builds DNA by putting in bases that match each strand thereby making a copy

CANNOT proof-read to make sure right so makes a lot of errors
Called mutations

Makes DNA copy highly mutated





HIV Cocktail



Three enzymes important for HIV to replicate:

Reverse Transcriptase: Copies virus RNA into DNA
Very, Very error prone

Integrase: puts viral DNA copy into host cell's DNA

Protease: Cuts proteins into functional pieces

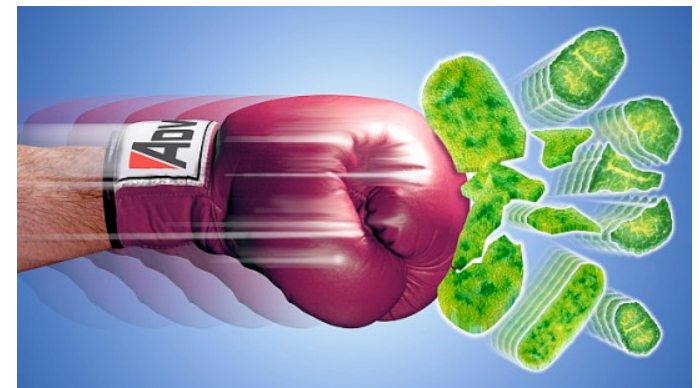


HIV Cocktail

Because HIV can mutate so rapidly
cant just knock out one enzyme
or mutations provide resistance to the drug

So have to knock out more than one (preferably all three)

Makes it much less likely that mutations will allow the
virus to survive in the presence of
many drugs with multiple targets.



The END????



The TRUTH is out there....

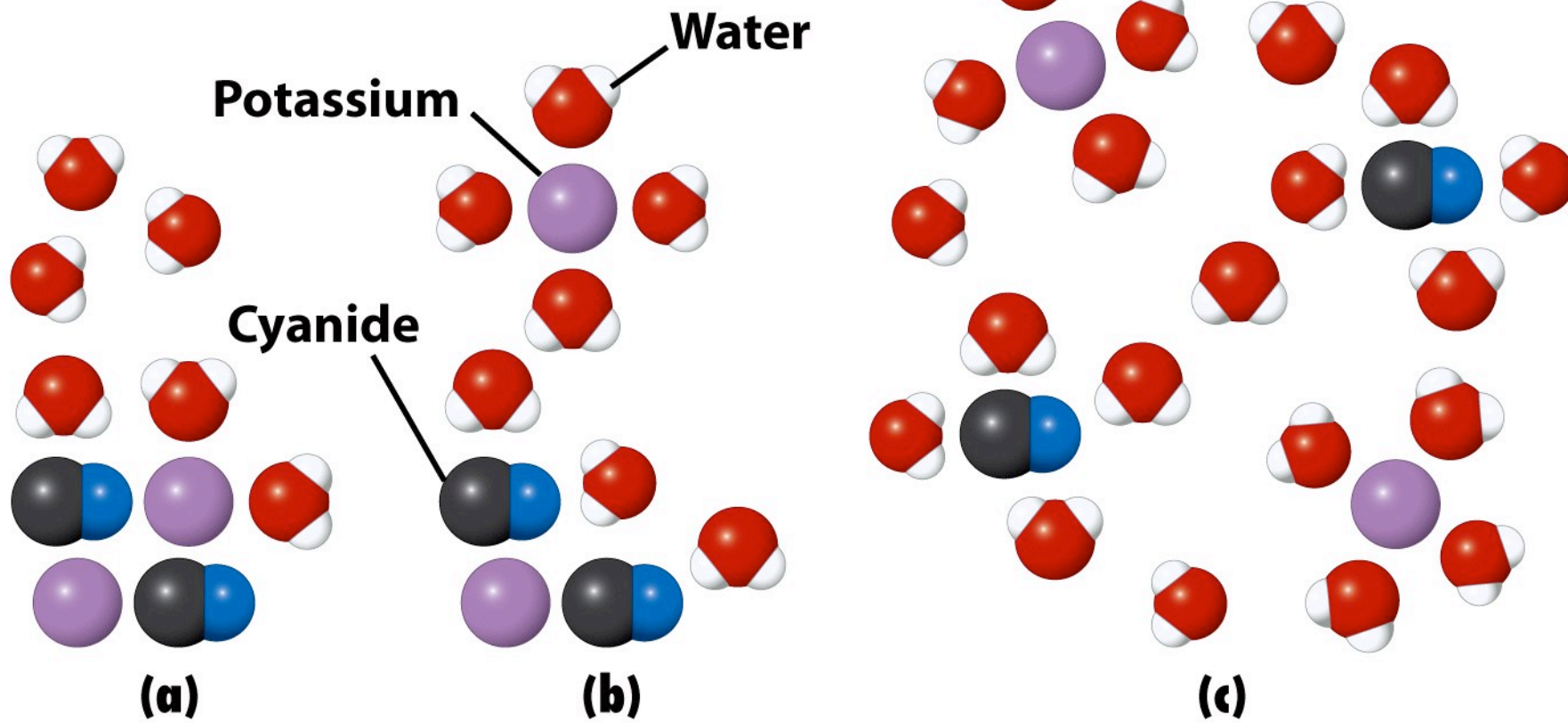


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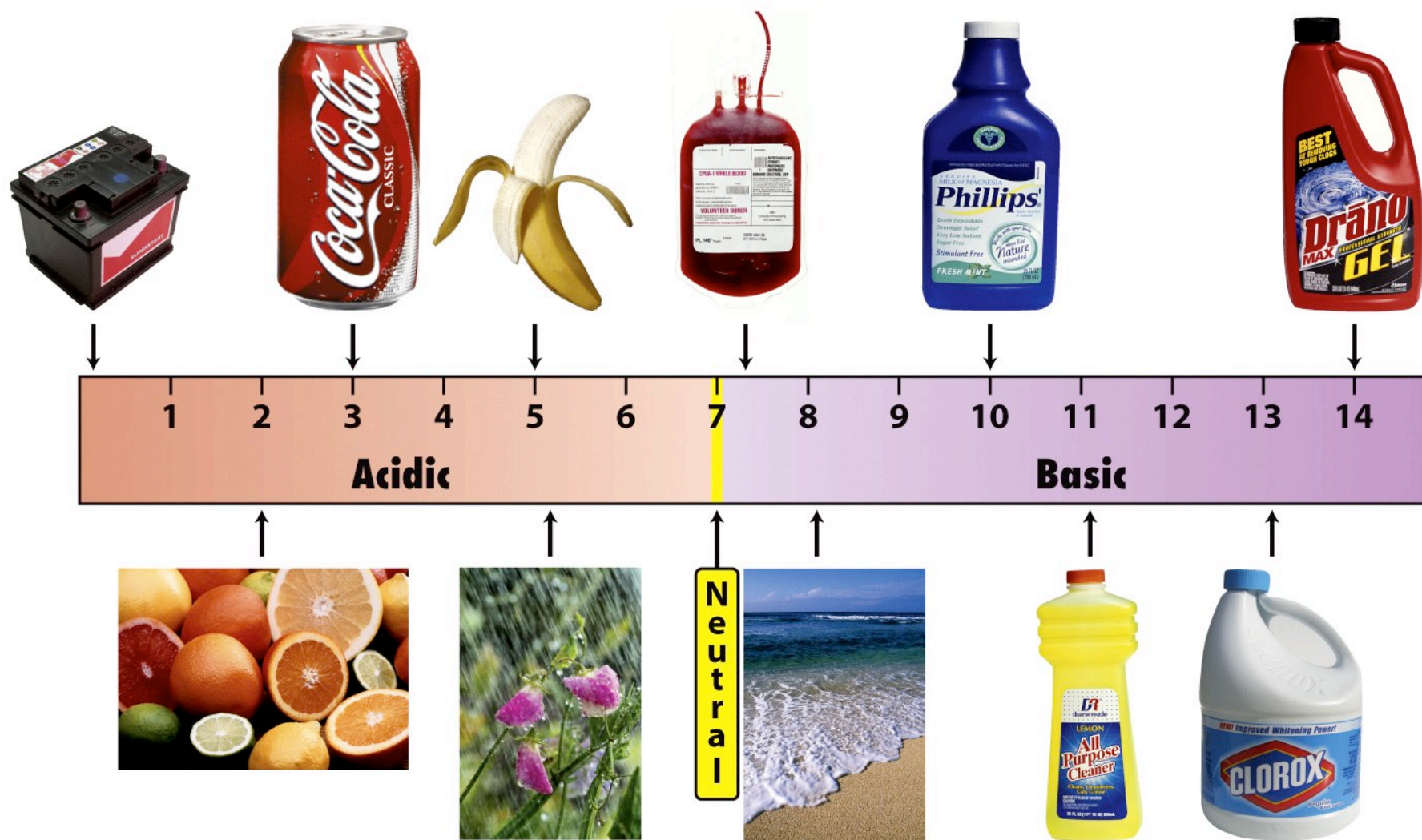


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Table 5.2 Names, Formulas, and Sources of Various Acids

Name	Formula	Strength	Common Use
Hydrochloric acid chemicals	HCl	Strong	Pool
Nitric acid	HNO ₃	Strong	Acid rain
Sulfuric acid	H ₂ SO ₄	Strong	Car batteries
Acetic acid	HC ₂ H ₃ O ₂	Weak	Vinegar
Carbonic acid	H ₂ CO ₃	Weak	Soft drink
Hydrofluoric acid	HF	Weak	Wheel cleaner
Phosphoric acid	H ₃ PO ₄	Weak	Hair coloring

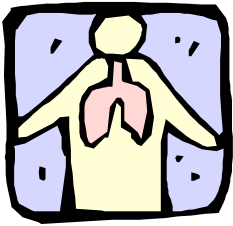
Table 5.3 Names, Formulas, and Sources of Various Bases

Name	Formula	Strength	Common Use
Ammonium hydroxide	NH₄OH	Weak	All purpose cleaners
Sodium hydroxide	NaOH	Strong	Drain cleaners
Potassium hydroxide	KOH	Strong	All purpose cleaners
Calcium hydroxide	Ca(OH)₂	Strong	Toilet bowl cleaners

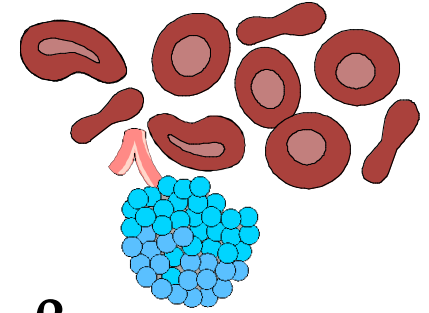
Table 5-3

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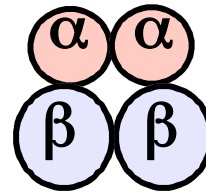
Bohr Effect



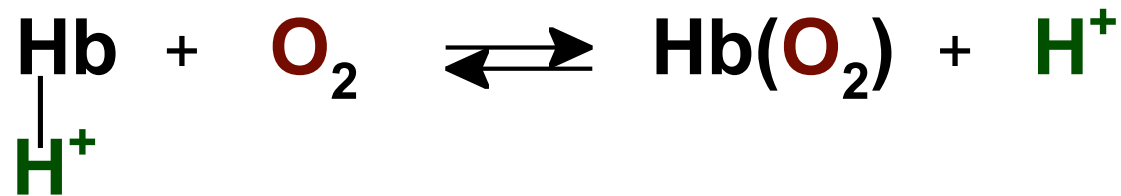
Hemoglobin (**Hb**) is a tetrameric protein (2α and 2β subunits)

- binds O_2 cooperatively

- each **Hb** can bind 4 O_2



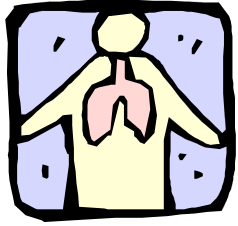
H^+ ions modulate O_2 binding to hemoglobin



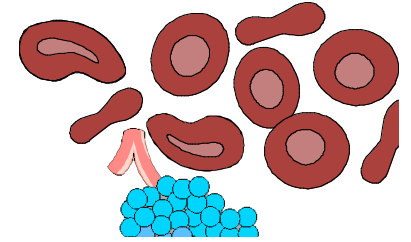
high H^+ / low O_2 (capillaries), O_2 is released

low H^+ / high O_2 (lungs), O_2 is bound

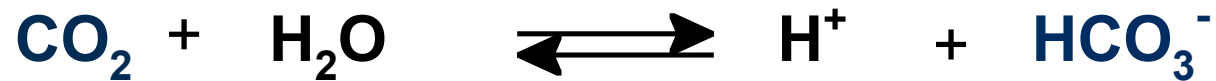




Bohr Effect



Called Bohr Effect (when O_2 binds to Hb, H^+ is released)



Relatively slow, need an enzyme to speed it up!

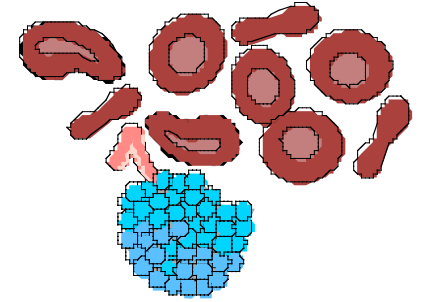
- Carbonic Anhydrase in RBC speeds up 100X

CO_2 waste is produced from metabolic processes in cells

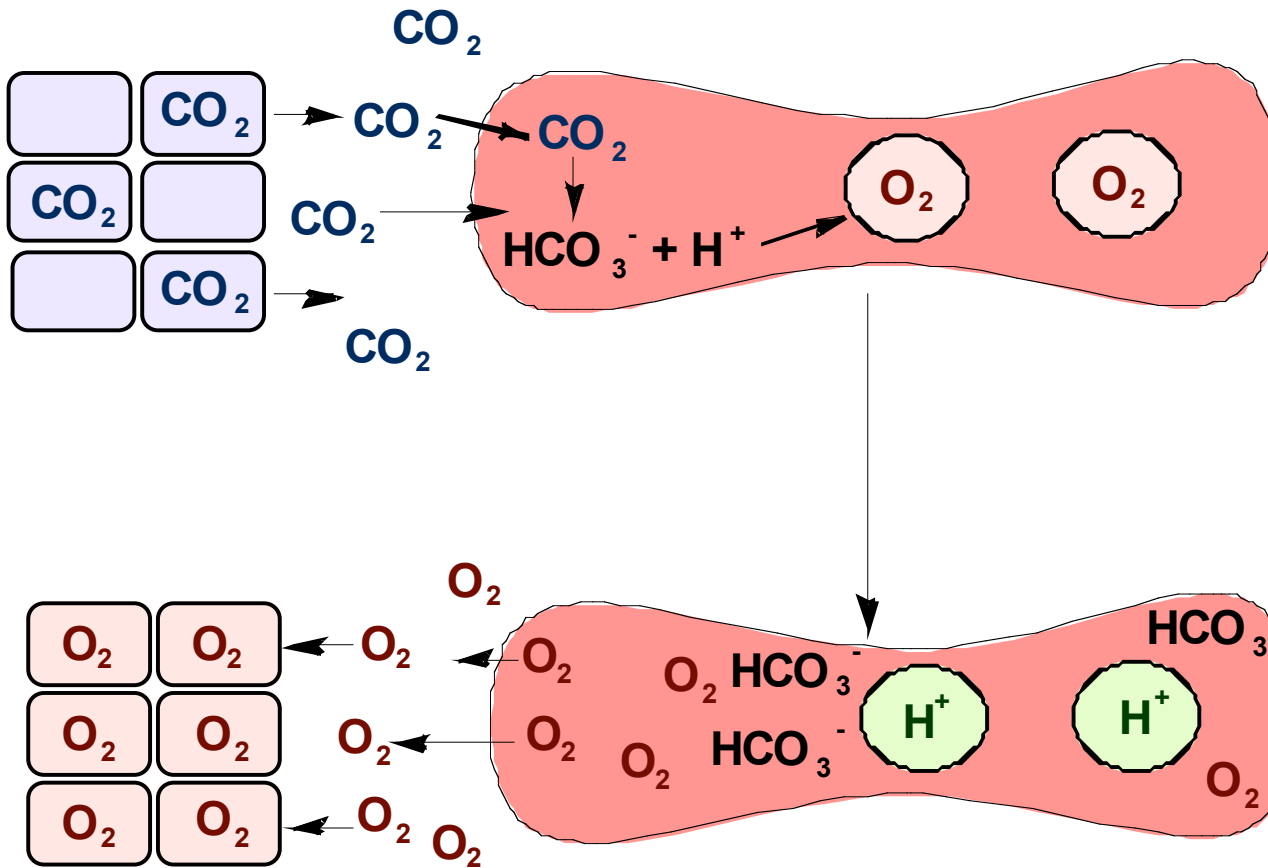
- diffuses out of cell into blood stream



CO₂ Transport



In Capillaries :

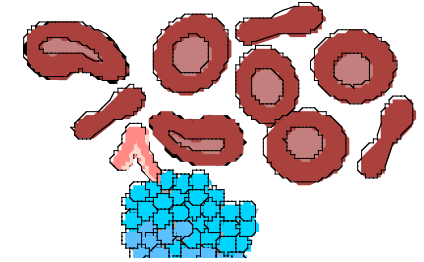


- CO₂ leaves tissues
- enters RBC
- producing HCO₃⁻ and H⁺

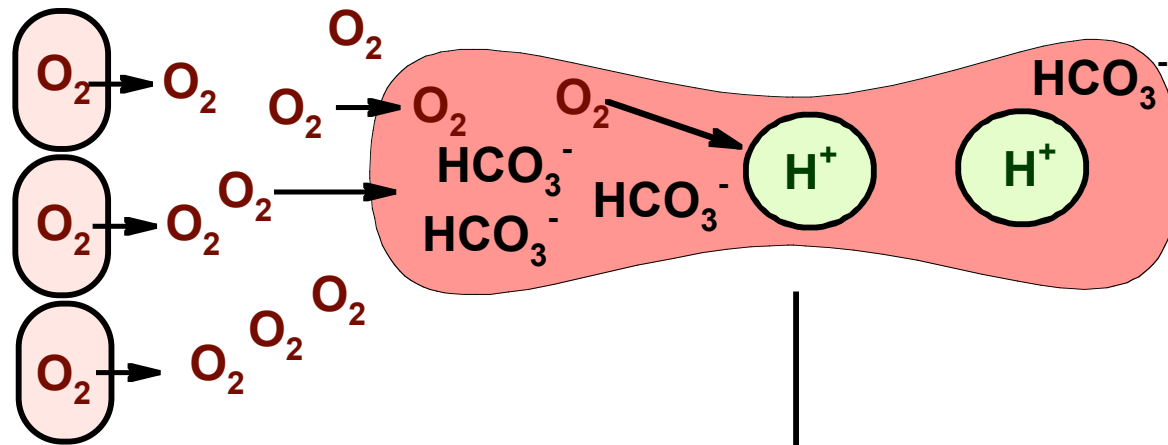
- H⁺ binds to Hb
- inducing O₂ release
- O₂ leaves RBC
- O₂ enters tissues



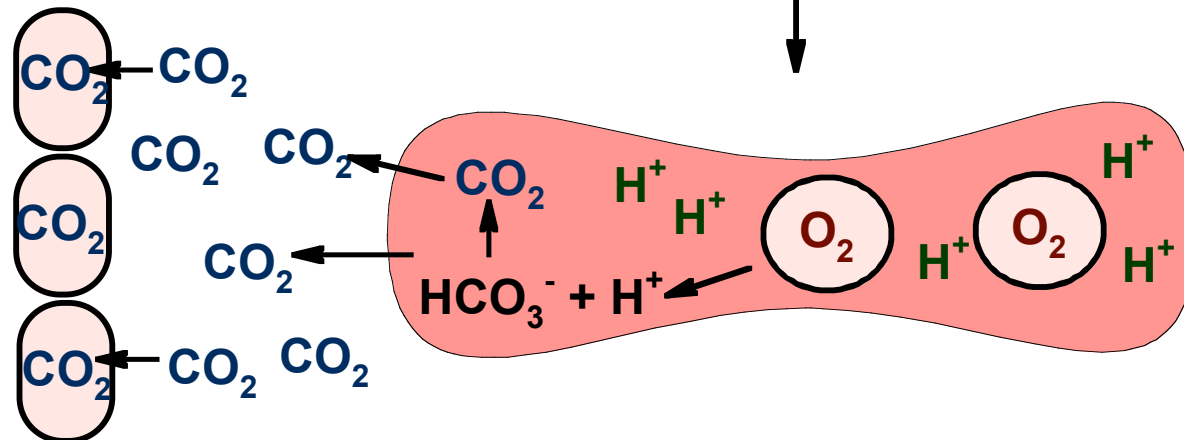
CO₂ Transport



In lungs:



- O₂ leaves aveoli
- enters RBC
- displaces H⁺



- increase of H⁺ causes
 $\text{HCO}_3^- \longrightarrow \text{CO}_2$
- CO₂ leaves RBC
- enters aveoli and is exhaled

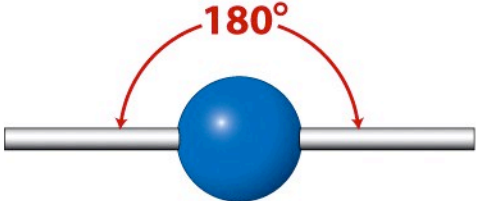
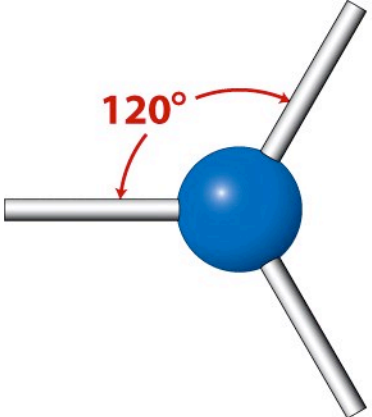
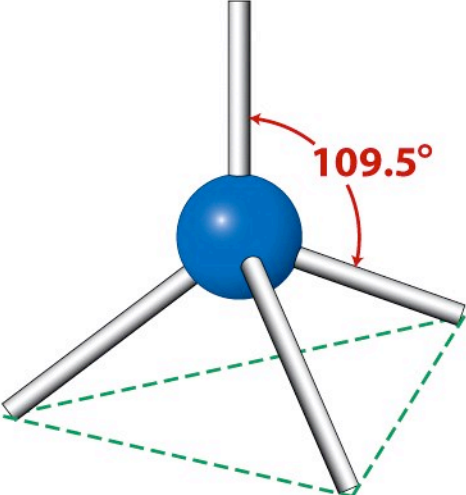
Electron Regions	Sketch	Electron Geometry
2 regions		Linear
3 regions		Trigonal planar
4 regions		Tetrahedral

Figure 8-8
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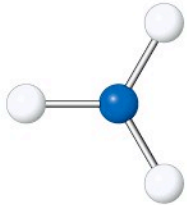
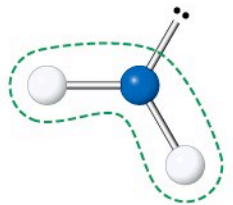
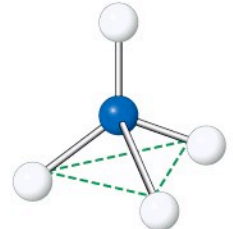
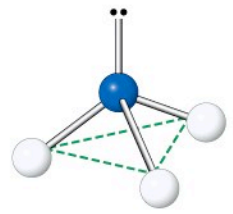
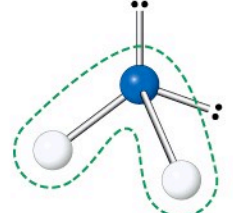
Electron Regions	Number of Lone Pairs	Sketch	Molecular Geometry
3	0		Trigonal planar
3	1		Bent
4	0		Tetrahedral
4	1		Trigonal pyramidal
4	2		Bent

Figure 8-9
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