

# Viruses

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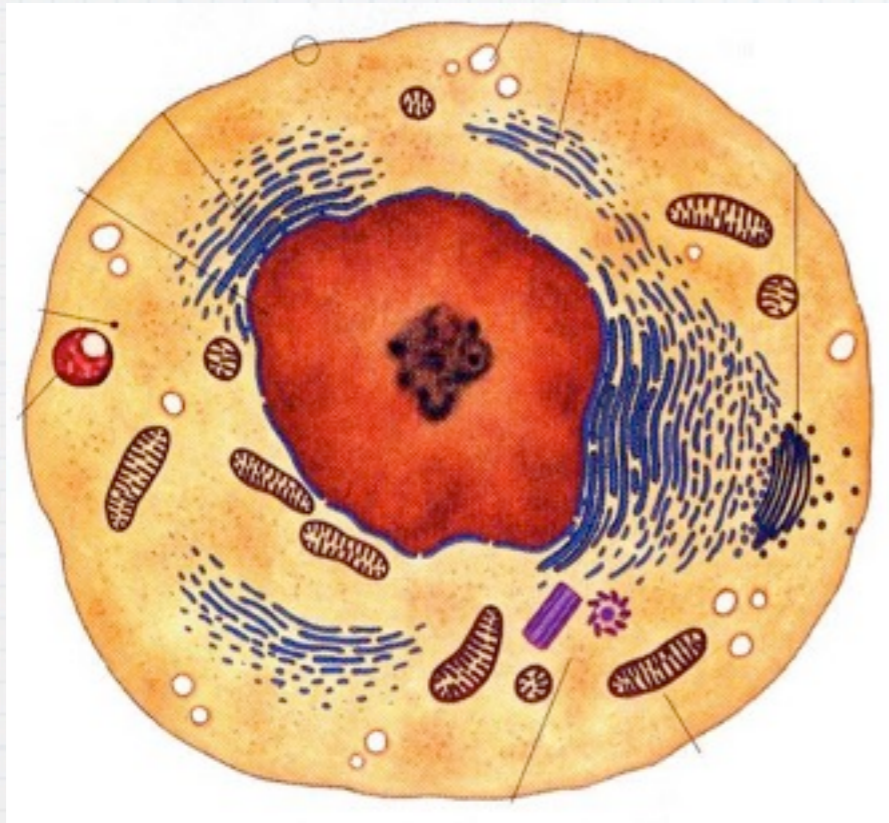
**Image of an animal cell**

**More realistic  
size of a virus  
compared to  
an animal cell**

**Cells can fulfill all  
characteristics of  
life**

**Viruses on their own  
can be considered  
lifeless chemicals,  
unless .....?**

# Image of an animal cell



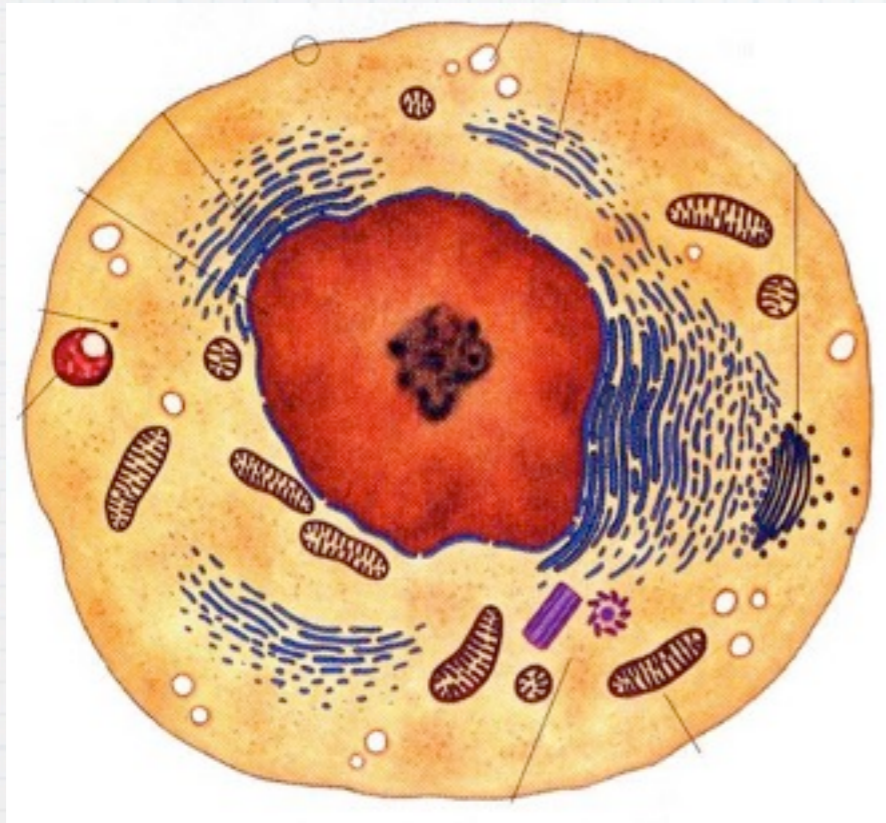
Cells can fulfill all characteristics of life

More realistic size of a virus compared to an animal cell



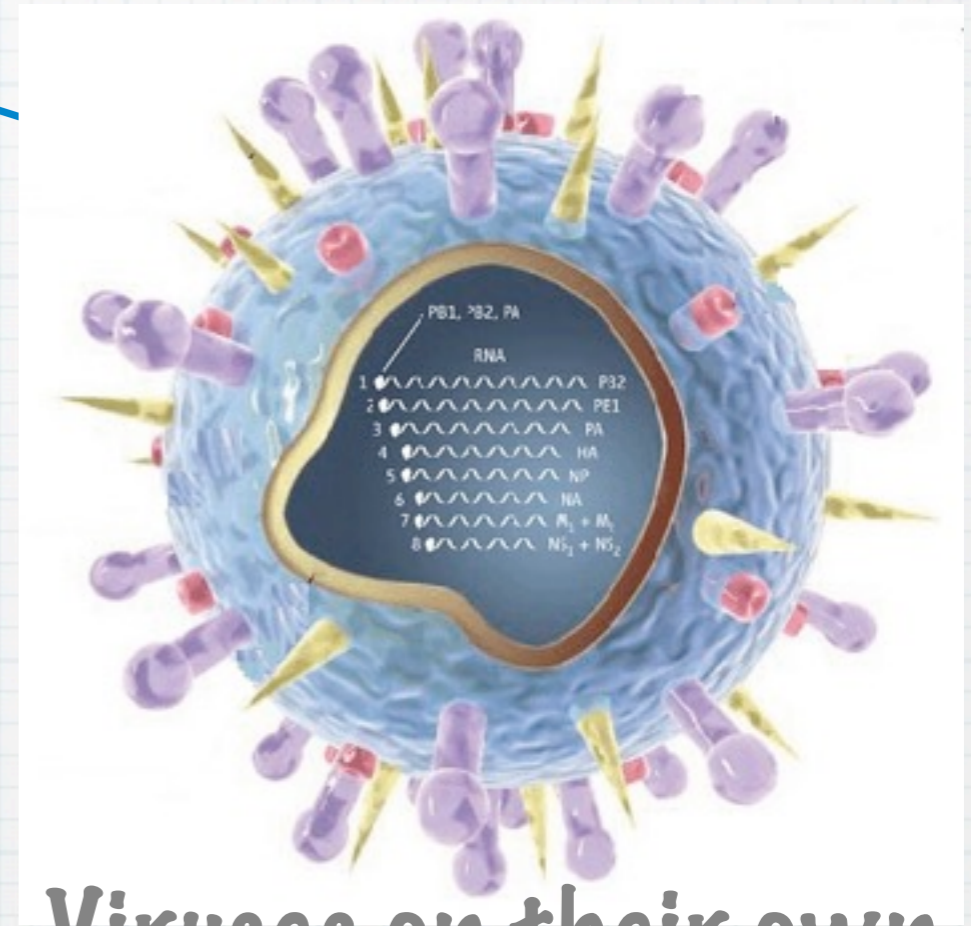
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# Image of an animal cell



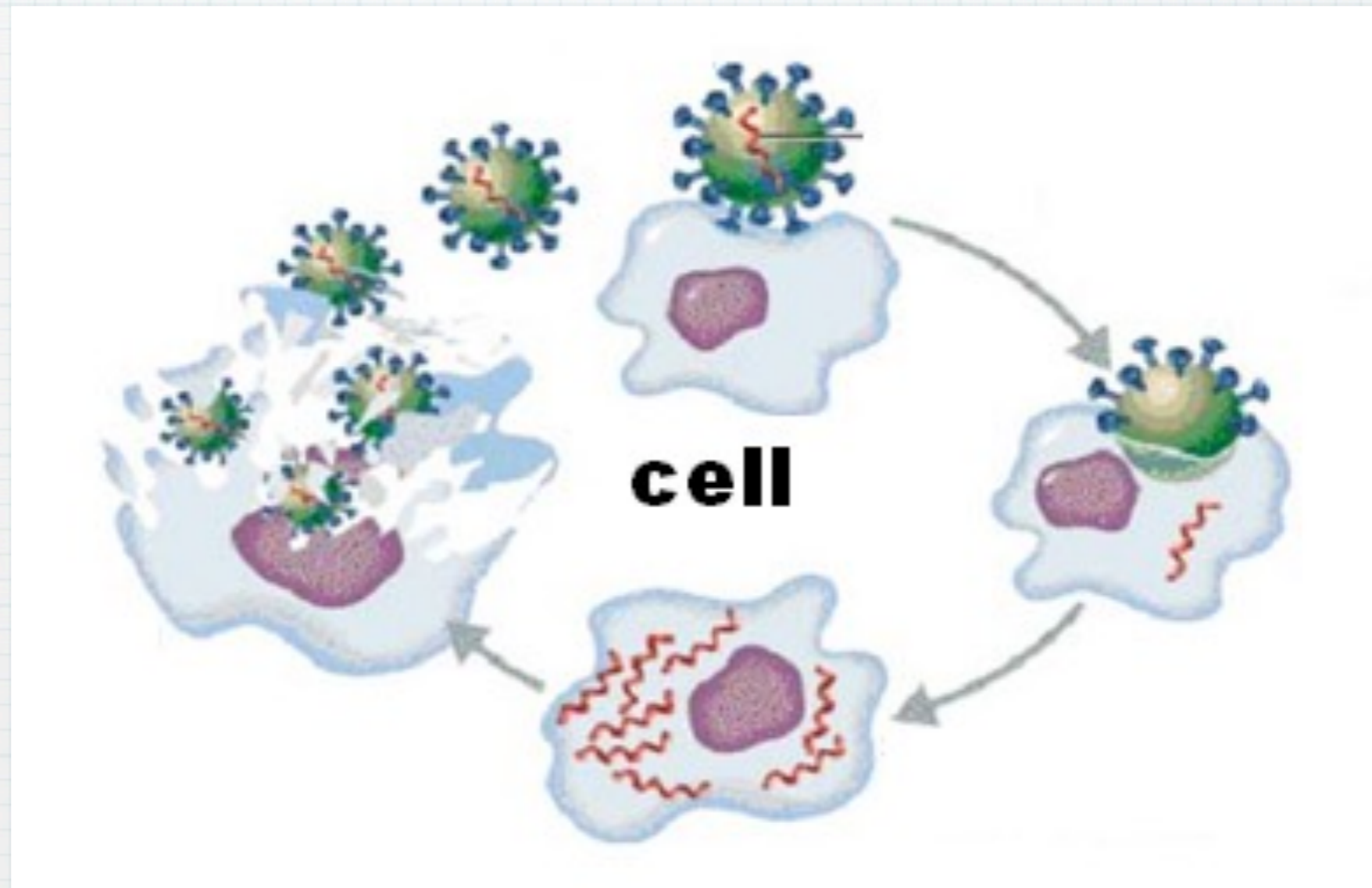
Cells can fulfill all characteristics of life

More realistic size of a virus compared to an animal cell



Viruses on their own can be considered lifeless chemicals, unless .....?

... unless they are  
reproducing



# Viruses

- \* Viruses are not considered to be living organisms because:
  - \* not made up of cells
  - \* only capable of 1 life function
  - \* i.e. reproduction & only within a living cell

# Viruses

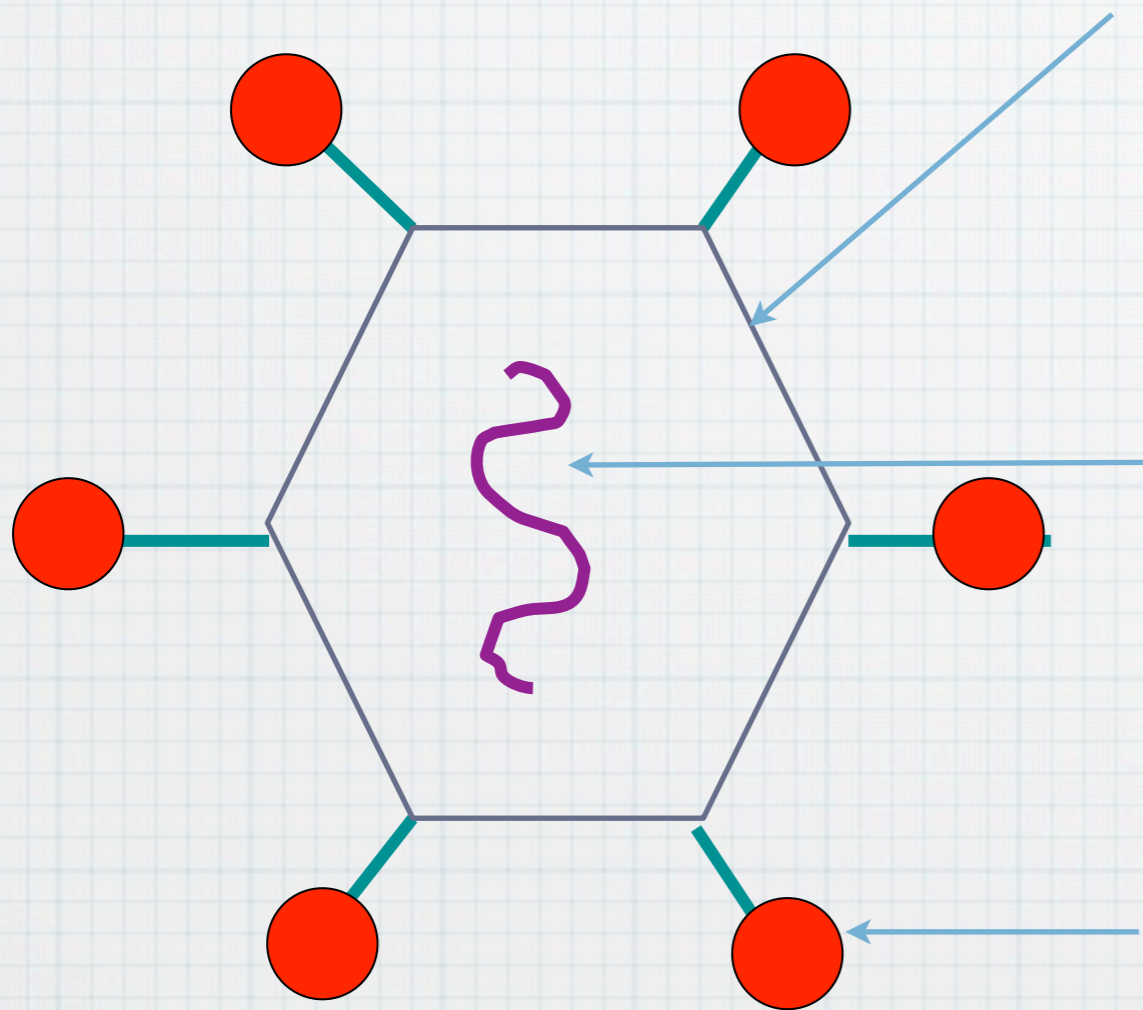
- \* **Virus: Microscopic biological particle that causes disease; composed of a protein coat that surrounds genetic material**
- \* **Capsid: external coat of a virus that is composed of repeating protein molecules**

# Viruses

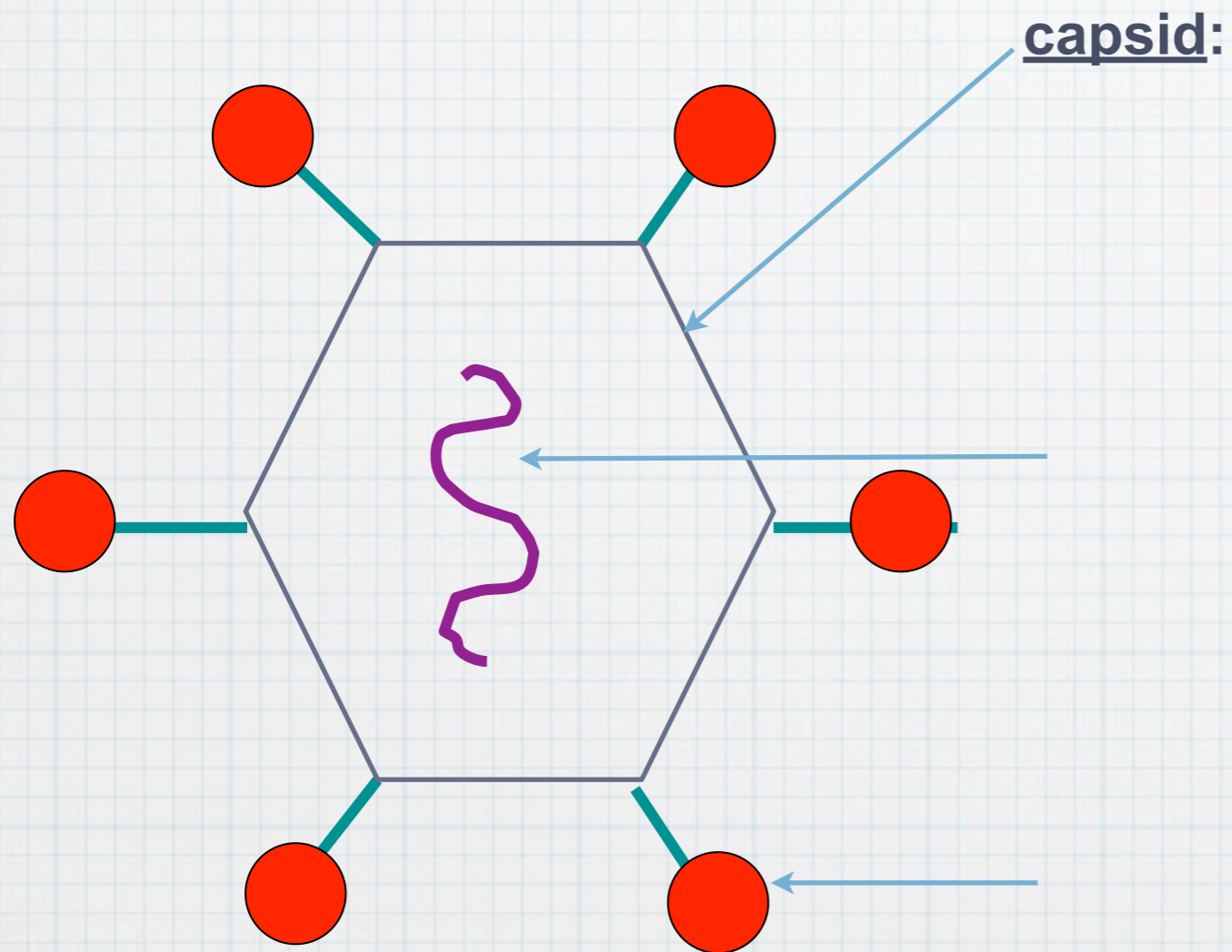
- \* Even though viruses are not living, microbiologists study them because
  - \* i) Cause disease by invading other organisms
  - \* ii) very small size



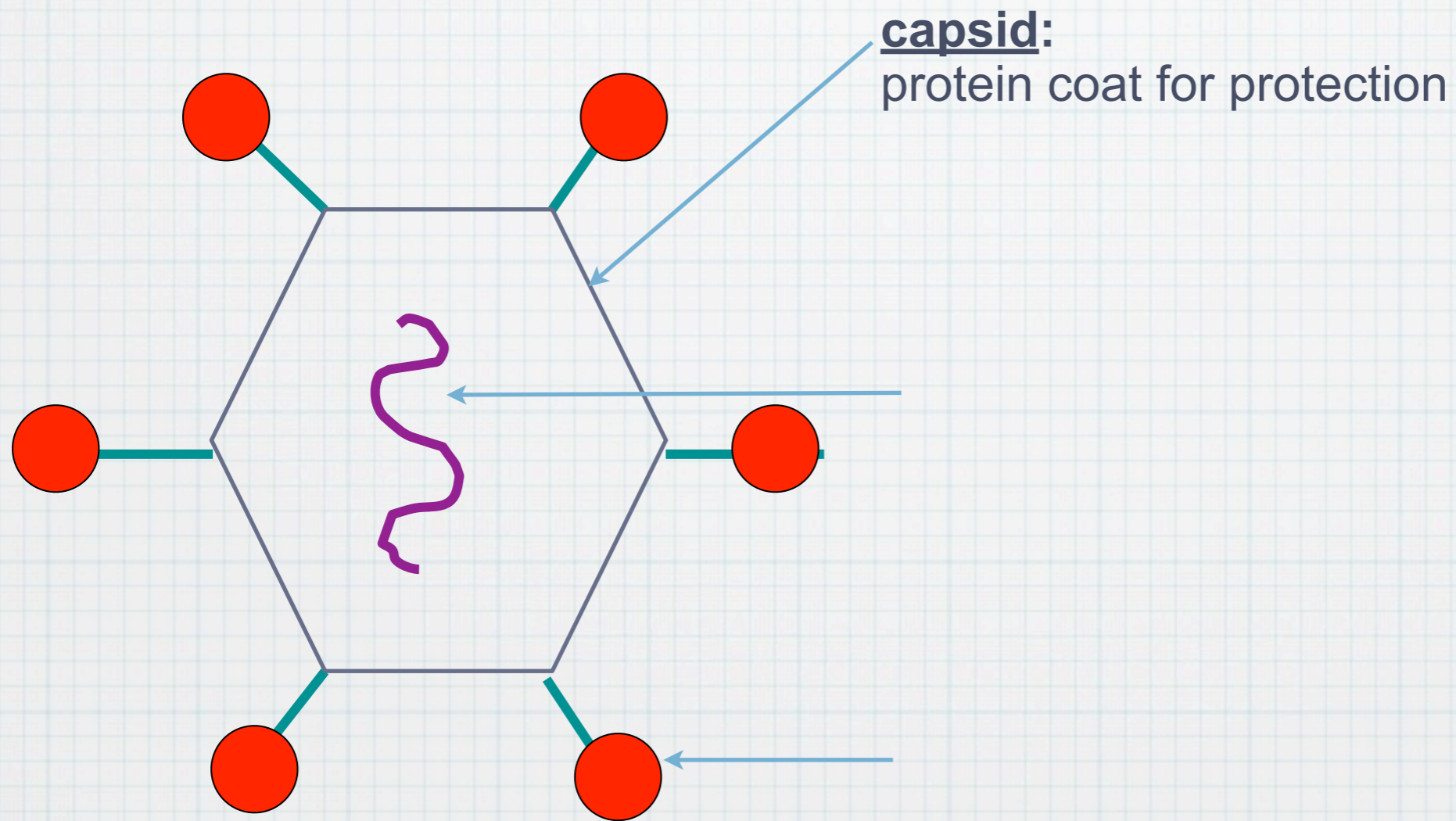
# Typical Viral Structure



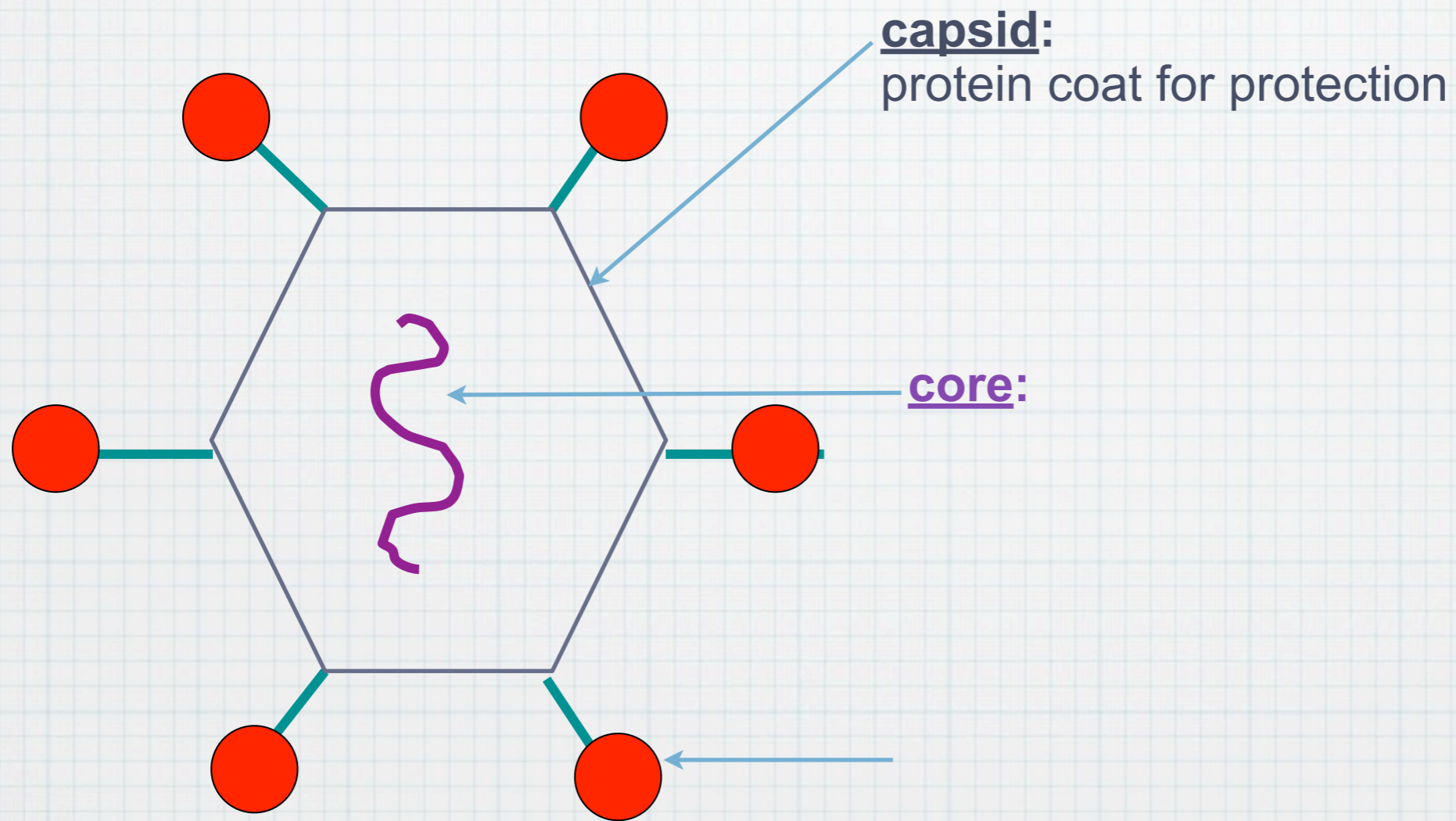
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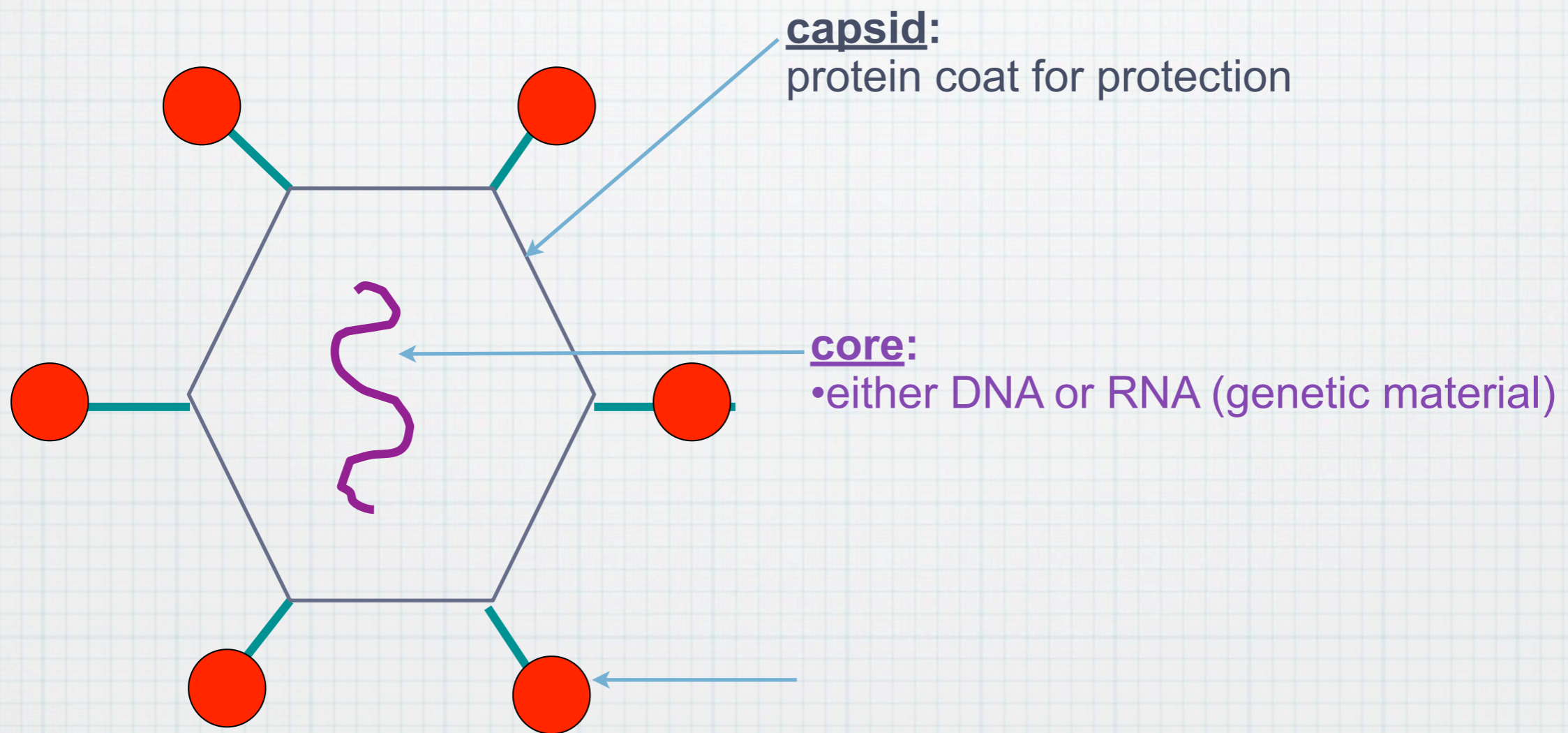
# Typical Viral Structure



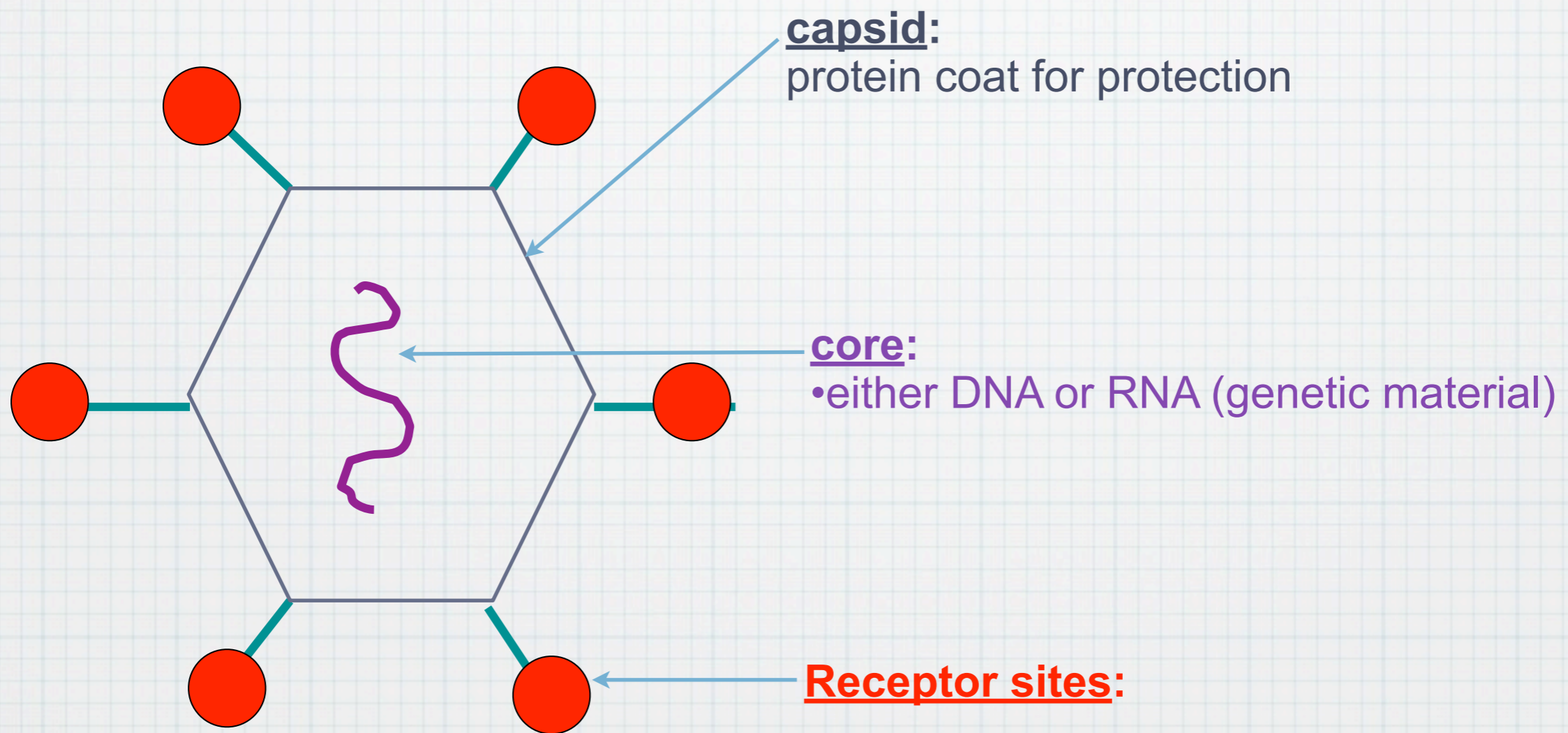
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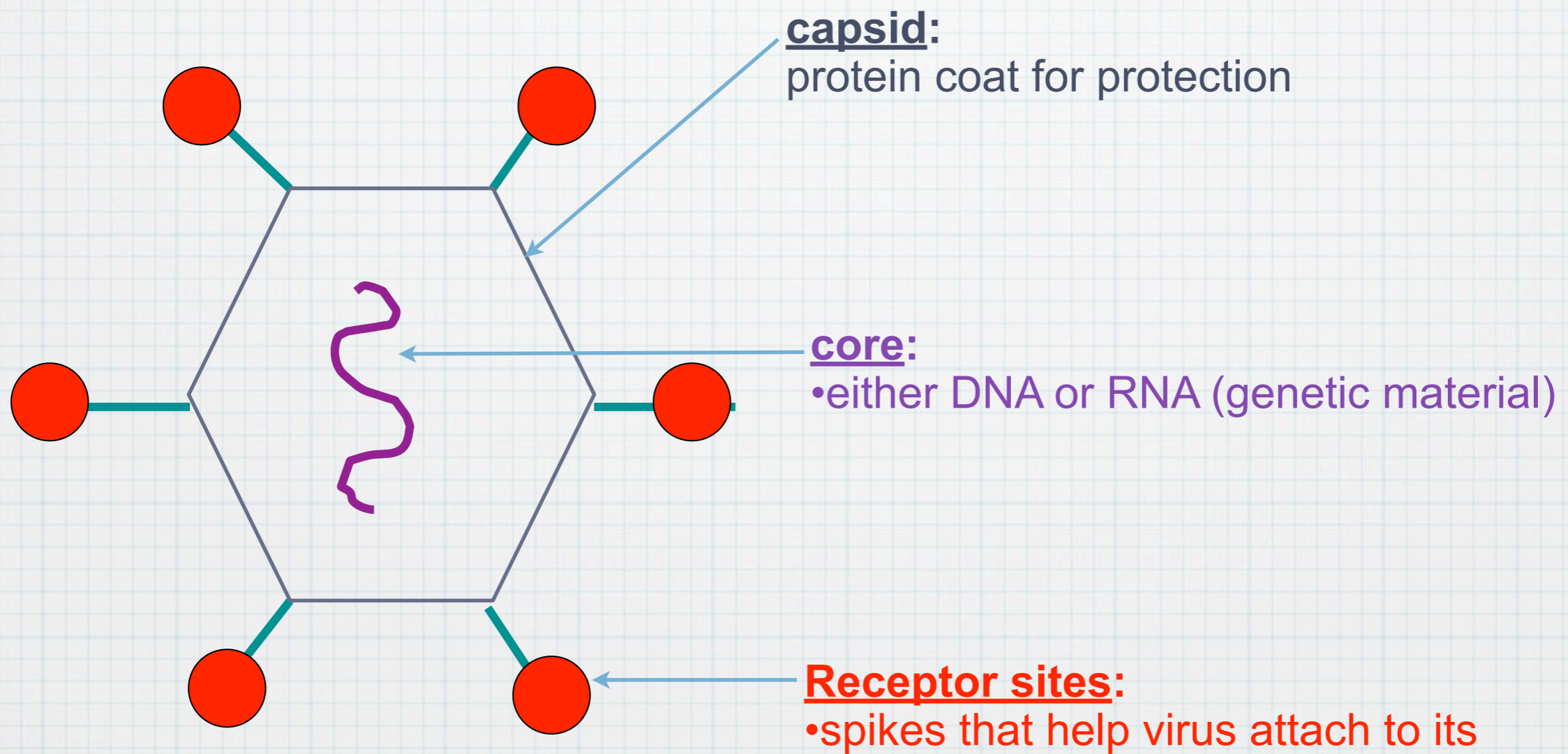
# Typical Viral Structure



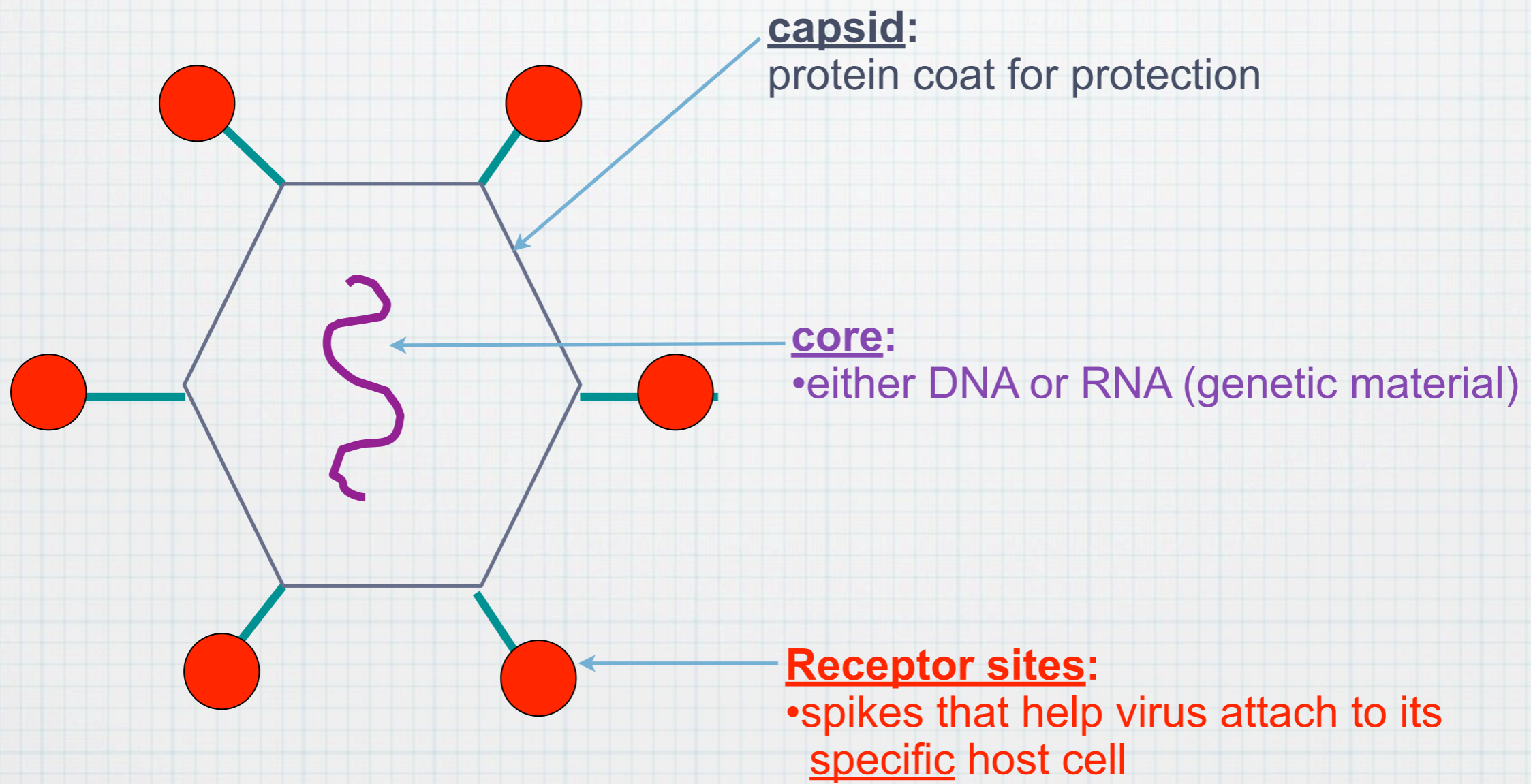
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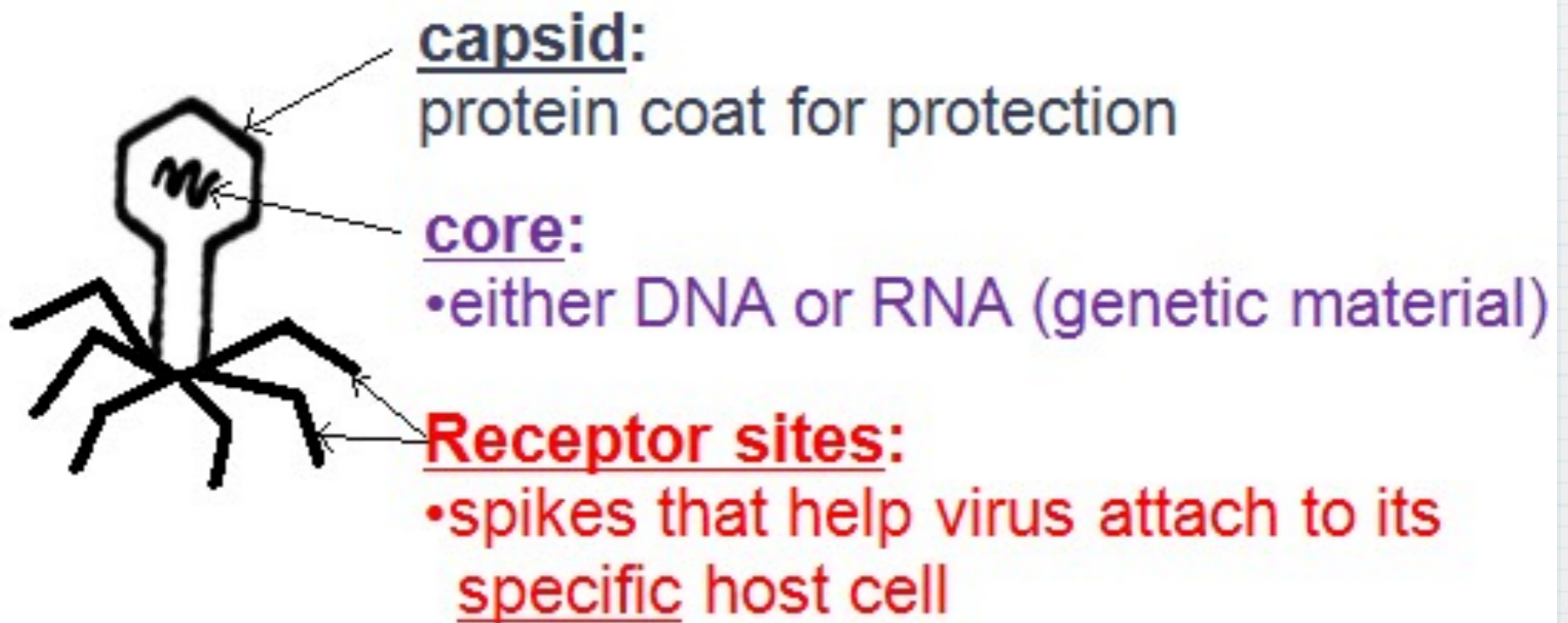


# Typical Viral Structure





# Typical Viral Structure



# Viral Capsids

## Rods or filaments:

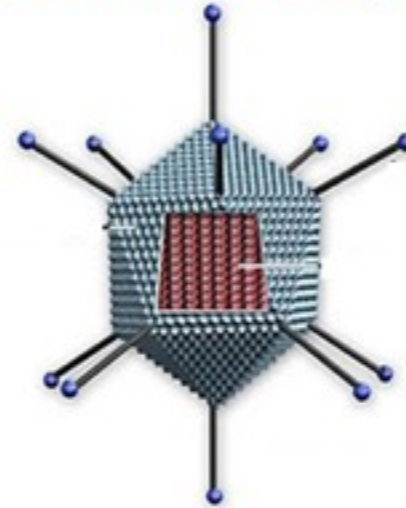


Ebola



Tobacco Mosaic Virus

## Geometric Shapes:

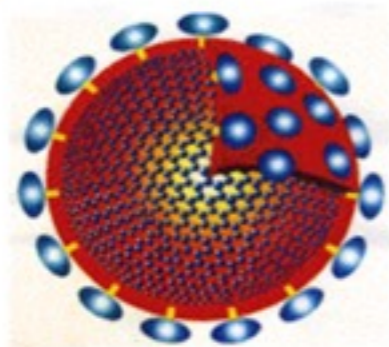


Adenovirus (colds)  
20-sided polygon  
(icosahedron)



Page 104  
Bacteriophage T<sub>4</sub>  
(infects bacteria)

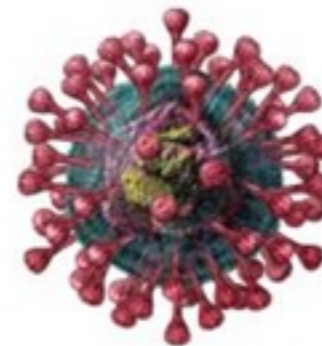
## Spherical:



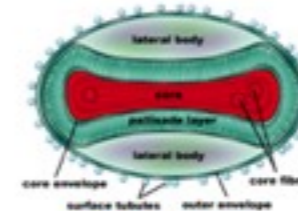
HIV



Influenza



SARS



Smallpox

# Classification

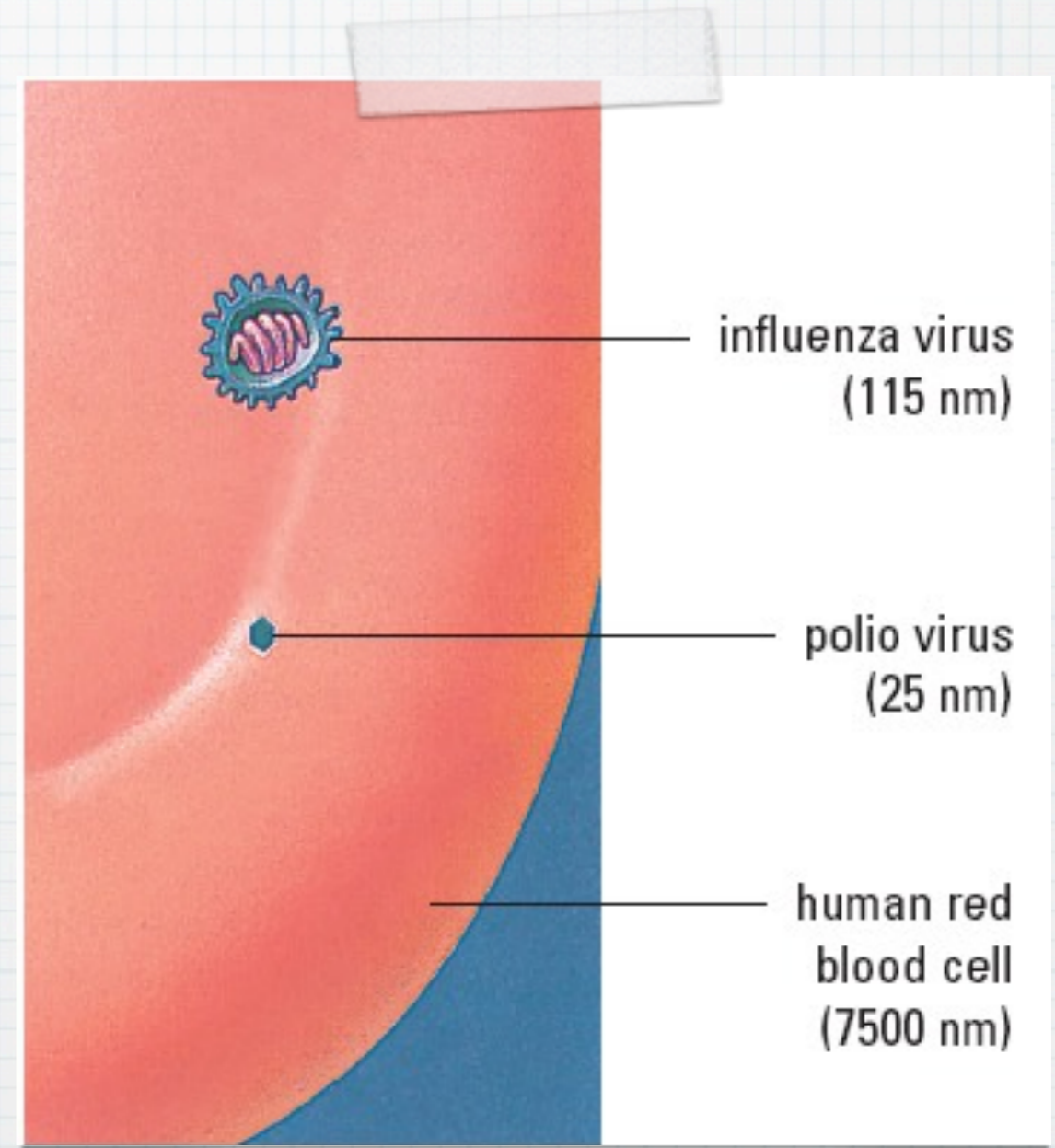
- \* Viruses are classified by:
  - \* 1) The organisms they infect
    - \* host range (types of cells that the virus can infect)
      - \* a) cold virus (human respiratory cells)
      - \* b) rabies (nerve cells in dogs)
      - \* c) HIV (human white blood cells)
      - \* d) bacteriophage (bacteria)

# Classification

- \* Viruses are classified by:
  - \* 2) Structure
    - \* size and shape of the capsid
    - \* type genetic material

# Viral Size

- \* very small, measured in units called nanometres (nm)
- \*  $1\text{nm} = 1 \times 10^{-9}\text{ m}$
- \* (billionth of a metre)



# Viral Replication - Lytic Cycle

- \* Step 1 - A&P: Attachment & Penetration
  - \* Virus attaches to host and injects DNA
- \* Step 2 - Synthesis
  - \* Viral DNA instructs cell to produce more virus parts

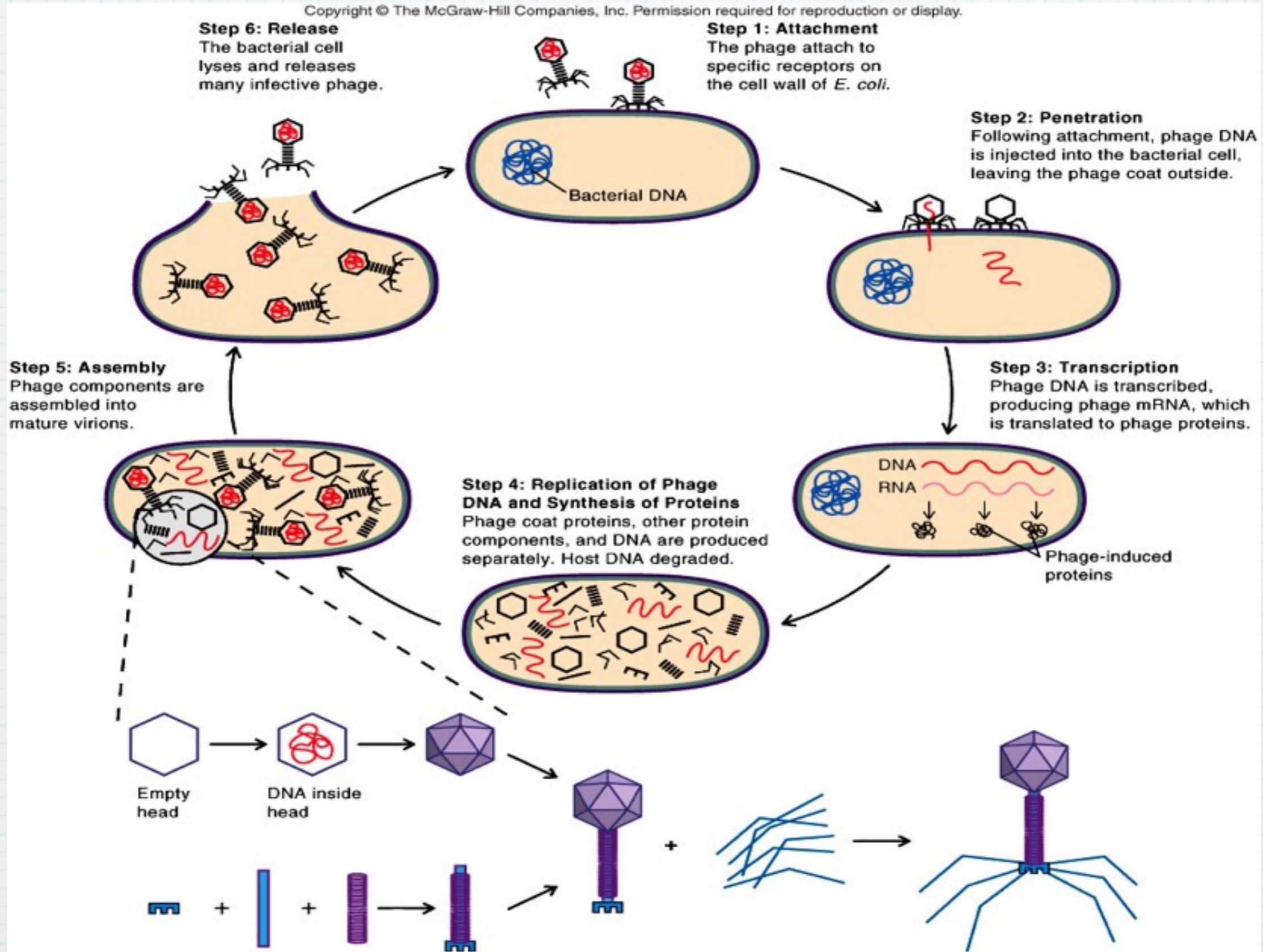
# Viral Replication - Lytic Cycle

- \* Step 3 - Assembly
  - \* New virus parts assembled into new viruses
- \* Step 4 - Release
  - \* New viruses released from infected cells.

# Viral Replication - Lytic Cycle

- \* The lytic cycle may be completed in only 25-45 minutes
- \* Hundreds of new viruses released.





# Viral Replication - Lysogenic Cycle

- \* Virus goes DORMANT (sleep)
- \* Virus injects DNA, does not take control of host.
- \* Cell reproduces normally, all daughter cells contain the virus.
- \* Host cell does not die.
- \* At some point the virus can be triggered to re-enter lytic cycle (pregnancy, illness, stress)

# Why Are Viruses Hard to Treat?

- \* No drug is available to kill viruses in the body

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- \* Some viruses are lysogenic - can remain dormant for years (hide inside cells)
- \* ex. a) Herpes Simplex Virus I (HSV I)

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- \* No drug is available to kill viruses in the body
- \* Some viruses are lysogenic - can remain dormant for years (hide inside cells)
  - \* ex. a) Herpes Simplex Virus I (HSV I)
- \* Some viruses can cause cells to become cancerous (HPV)

# World's Deadliest Virus

\* What is the world's deadliest virus?

**\* ... RABIES**

**\* Has a fatality rate of nearly 100%  
once diagnosed.**