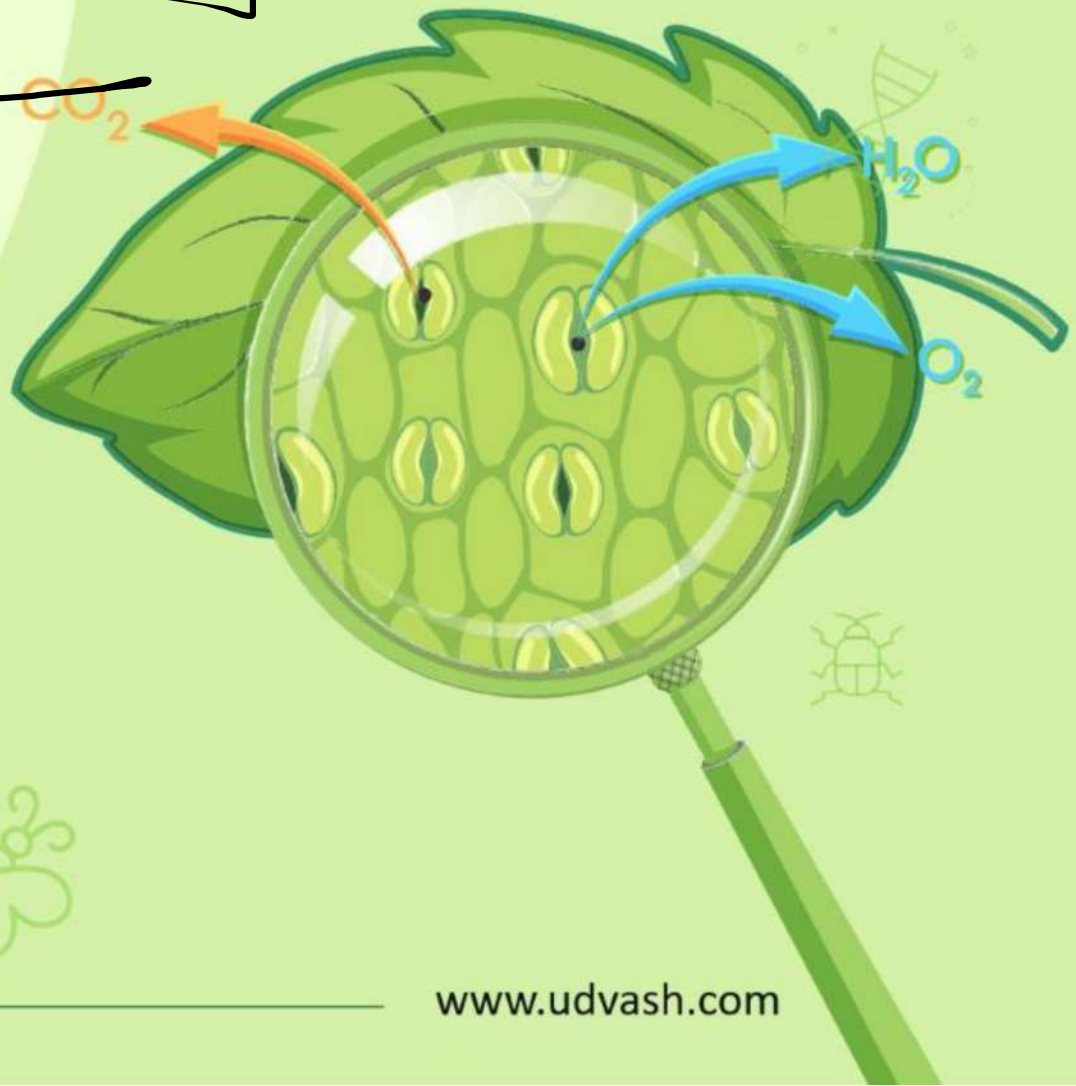
Shuvo Mohajon
DME/4th
FCC

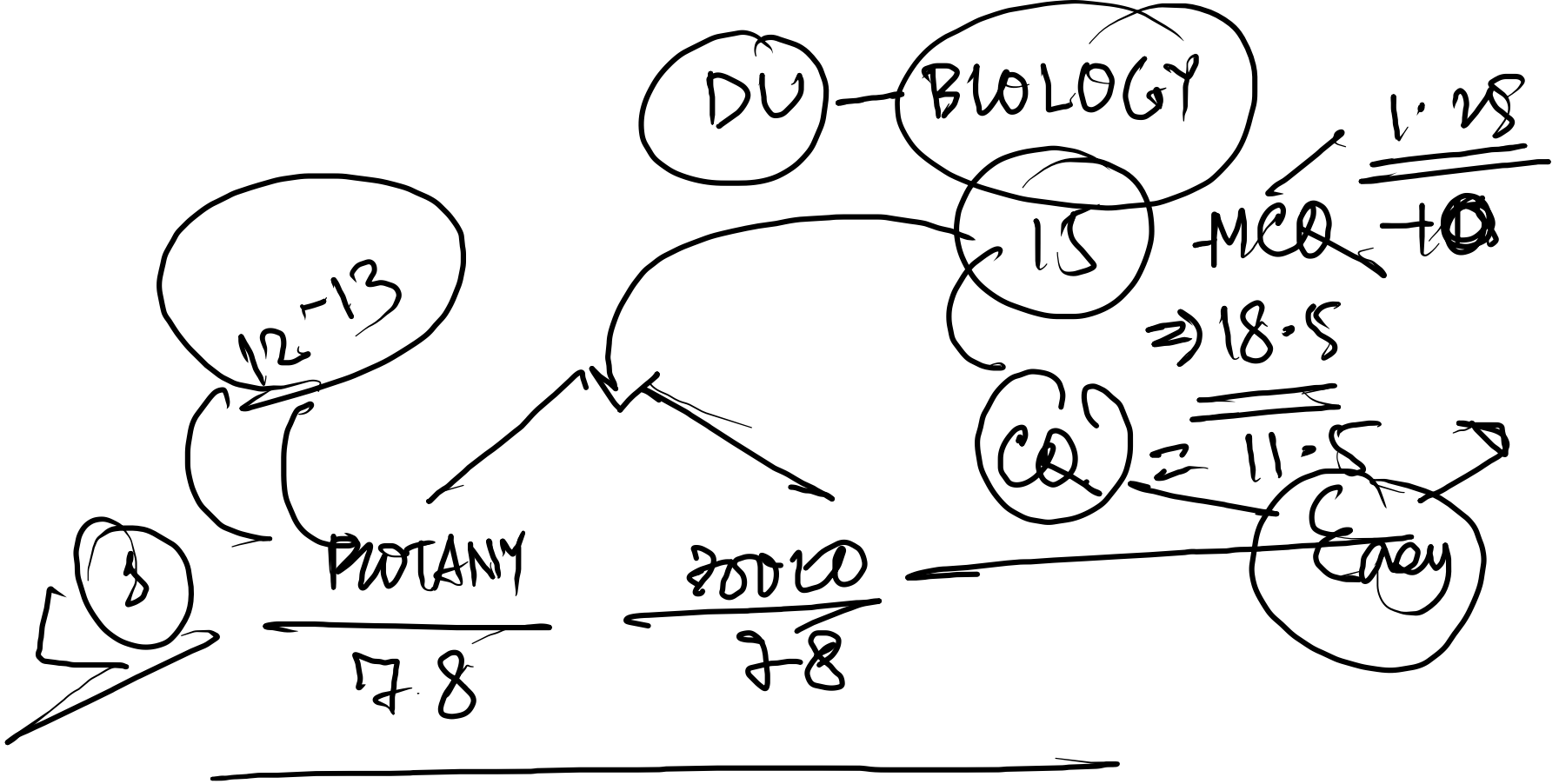
Engineering Admission Program-2020

BIOLOGY

Lecture : B-01

Chapter 4 : Microorganisms (1st Paper)




DU
BIOLOGY
15
MCQ
1·25
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Easy
12-13
8
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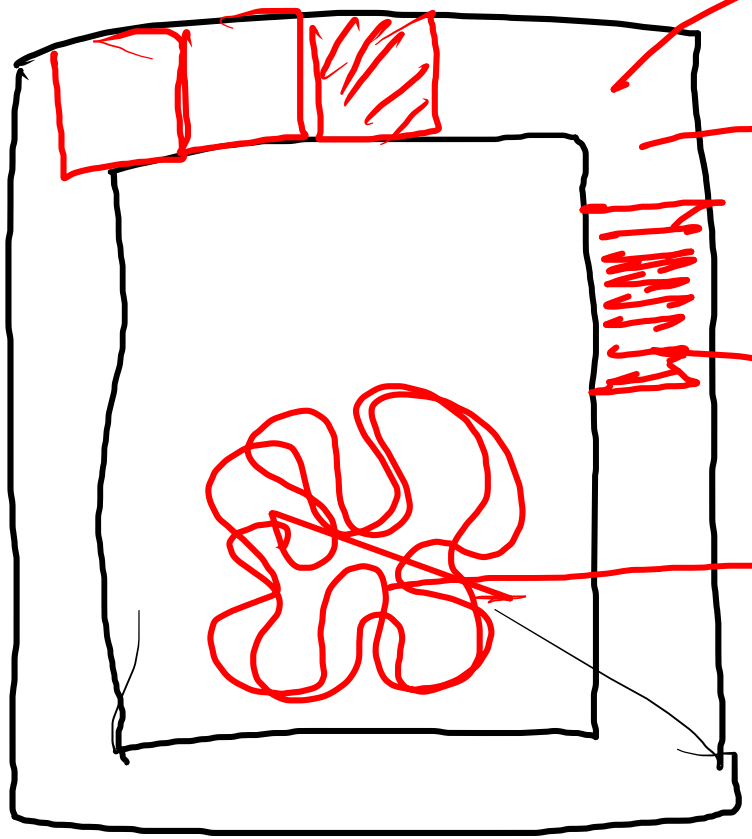
20020
7 8

VIRUS (only acellular microorganism)

✓ Compartment :→ wall

Normal Cell :→ plant → Cell wall → cellulose

Wall have subunit called as/ bricks



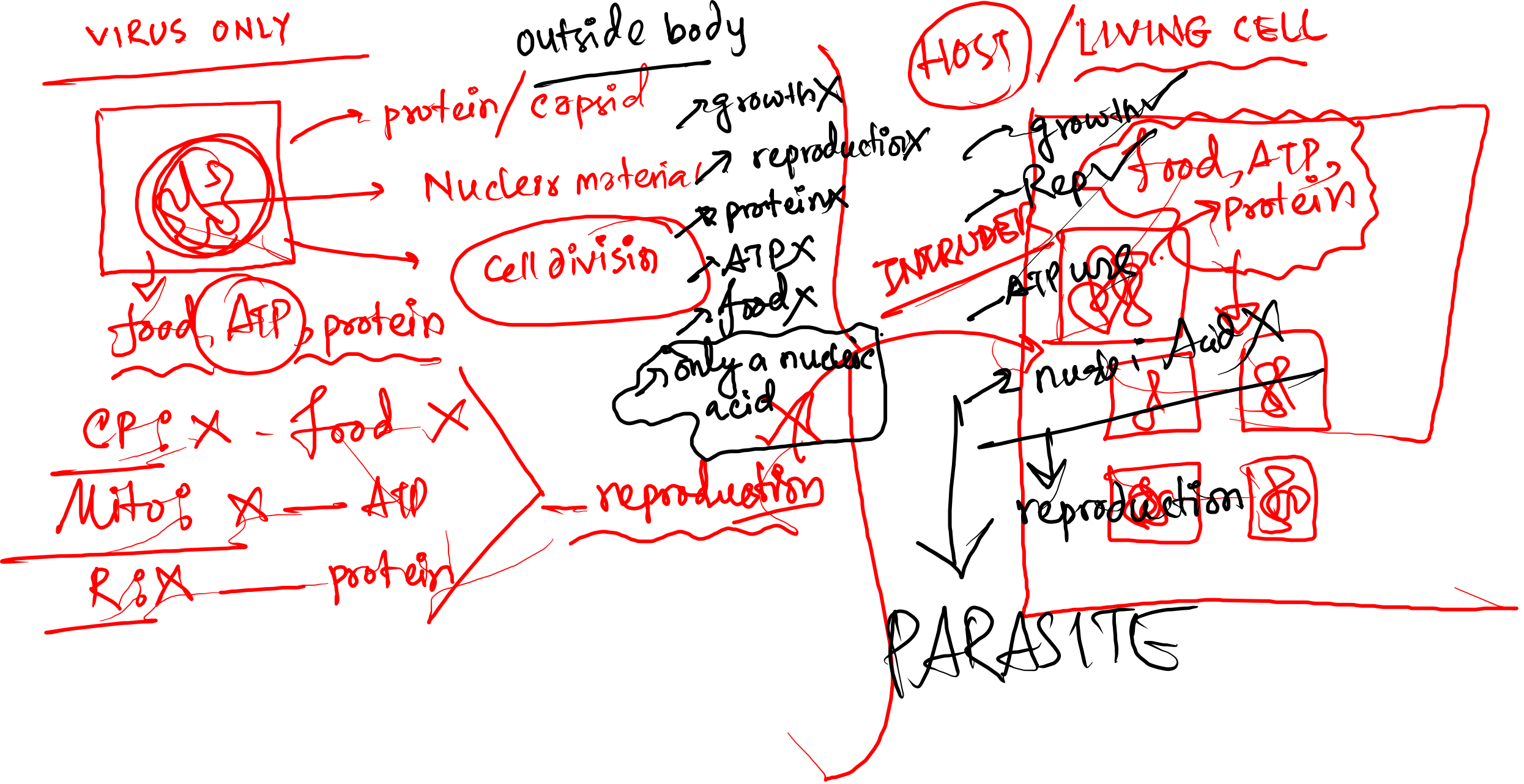
→ Cover → protein made

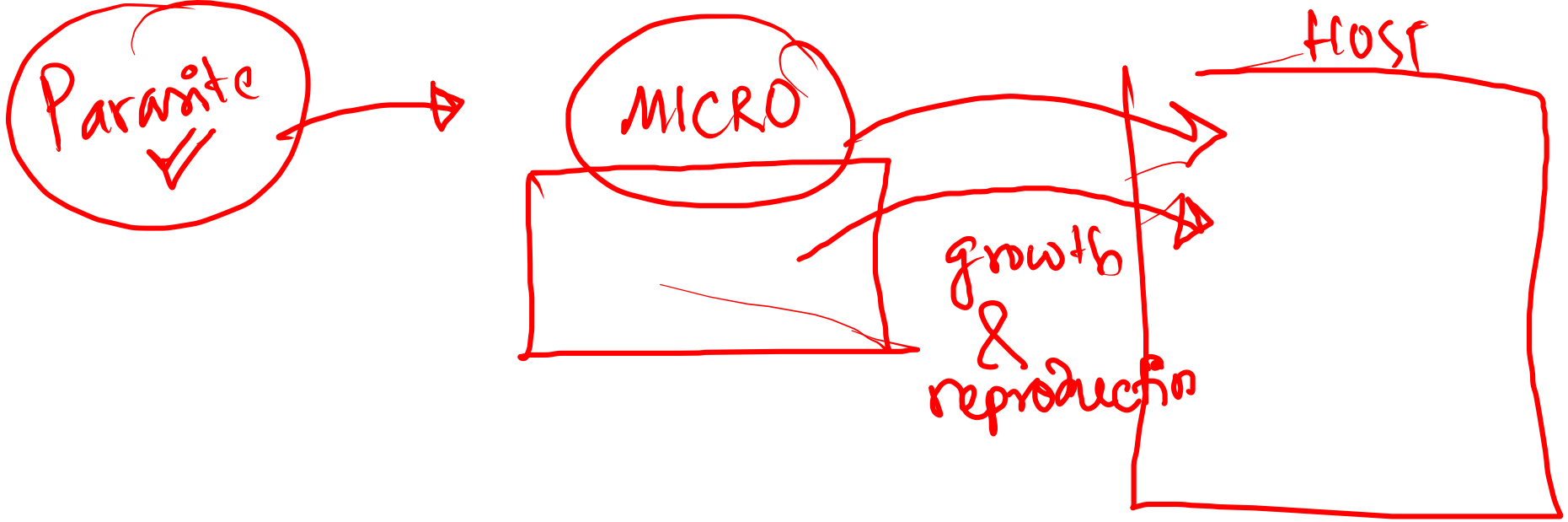
→ Capsid

subunit : capsomere

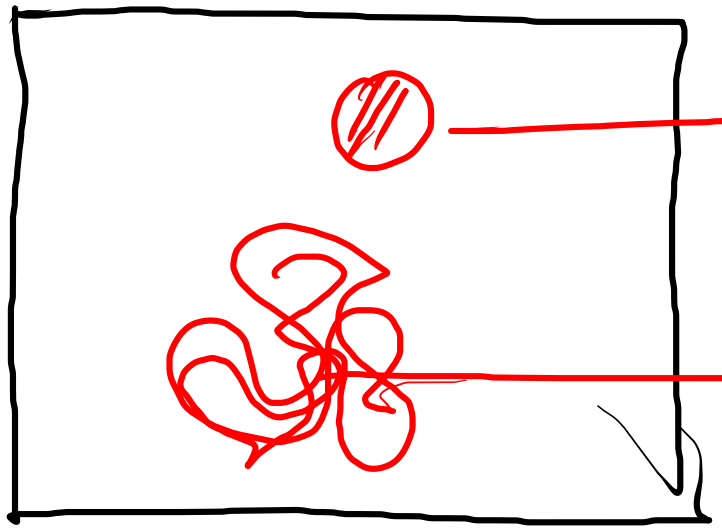
→ Only nucleic mat is present

✗ Ribosome → Protein Synthesis


VIRUS ONLY
outside body
protein/capsid
Nucleic material
food, ATP, protein
Cell division
growth X
reproduction X
protein X
ATP X
food X
only a nucleic acid
CP X — food X
Mito X — ATP
R X — protein
reproduction
HOST / LIVING CELL
INTRUDER
growth
Rep
food, ATP, protein
ATP use
nucleic Acid X
reproduction
PARASITE


Parasite
MICRO
HOST
growth
&
reproduction

COMPARTMENT → CELL ???



RIBOSOME

+

NUCLEAR MATERIAL

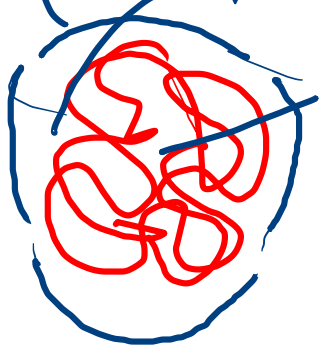
≠ CELL

Nucleic Acid

DNA / RNA

Nucleus

Nucleoplasm



DNA

DEVELOPED NM ??

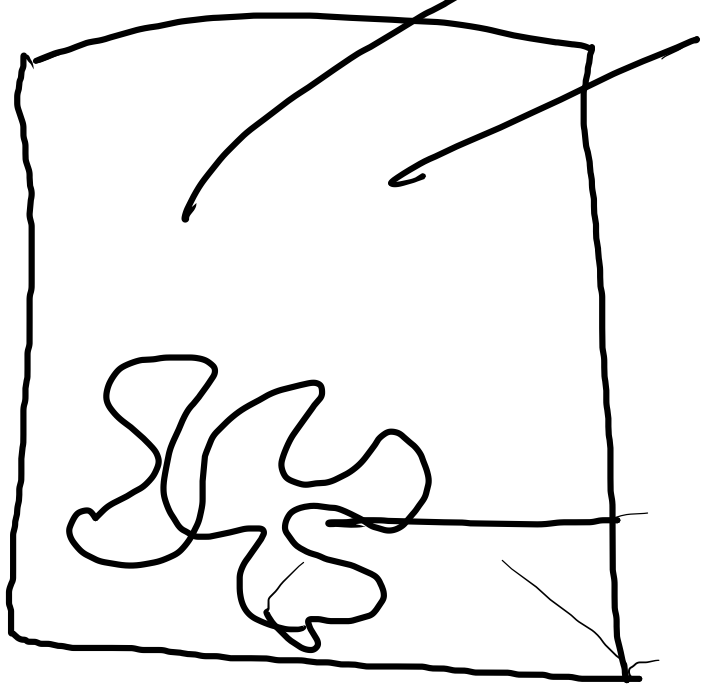
CELL → EUKARYOTIC CELL

UNDER. D

uncovered

→ PROKARYOTIC

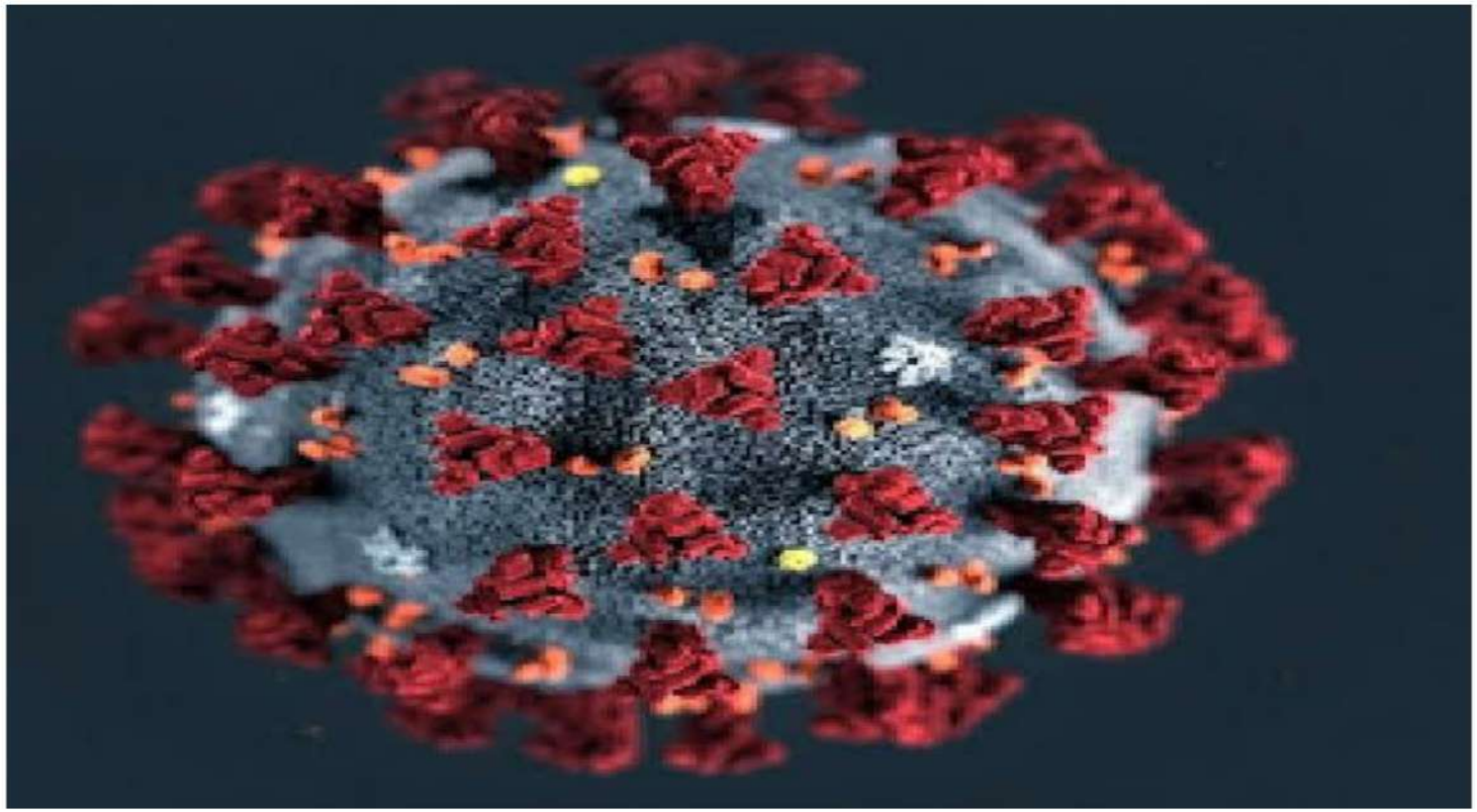
Acellular Microorganism ???



No Ribosome → Acellular microorganism

Either NM or ribosome is present

Virus

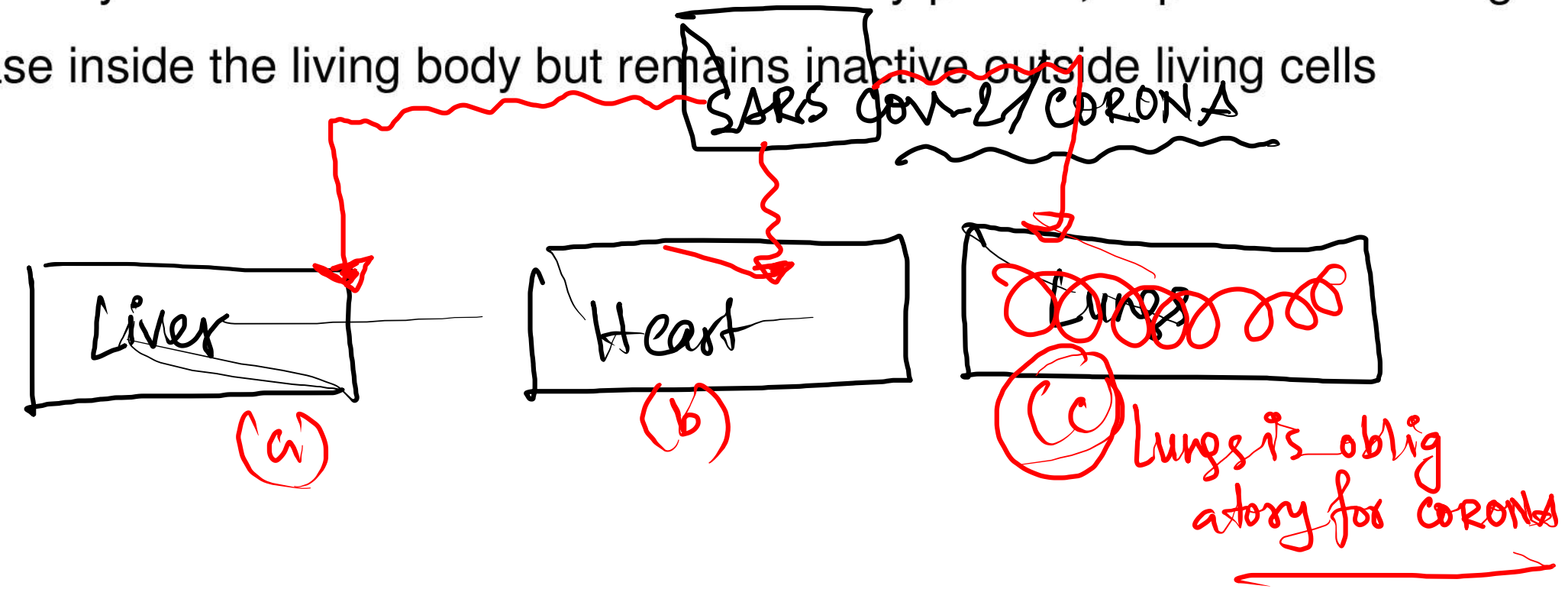


Important Topics of This Chapter:

- Virus
- Economical Importance of Virus
- Diseases cased by viruses
- Bacteria
- Economic importance of Bacteria
- Malarial parasite

What is virus?

Virus is an acellular, ultra microscopic, obligate parasite which is composed of centrally located nucleic acid and covered by protein, capable of causing disease inside the living body but remains inactive outside living cells



History of discovery of virus

- In 1796,Edward Jenner mentioned about the first viral disease Small Pox
- TMV was the first discovered virus. Scientist Adolf Meyer mentioned it as Tobacco Mosaic Disease
- DIMITRY IVONOVOSKY proved that the pathogen behind tobacco mosaic disease cant be separated after being filtered by bacteria preventing filter. He is known as the FATHER OF VIRUS DISCOVERY
- STANLEY separated virus as crystal and for this achievement he was awarded NOBEL PRIZE in 1946

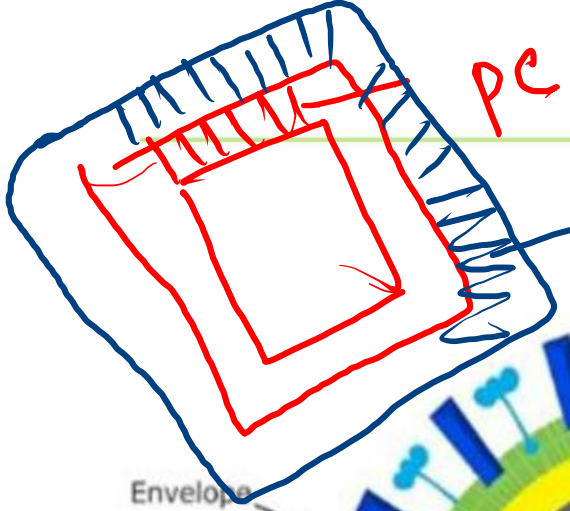
Non-living/Chemical Characteristics

- Virus does not contain cellular properties, like- cell wall, cell membrane and cytoplasm; that is why they are acellular and ultramicroscopic. They do not contain cytoplasm, cell membrane, cell wall, ribosome and mitochondria. They lack metabolic enzyme and property.
- Virus is not able to reproduce without the help of living cell.
- Virus cannot be filtered by bacteria-proof filter.
- Virus can be crystallized, centrifuged, diffused, suspended in water and precipitated.
- Viruses are inactive like chemical particles outside a living cell.
- Virus does not grow.
- Virus is resistant to acid, base and salt. Antibiotics cannot act against virus.

Living Characteristics:

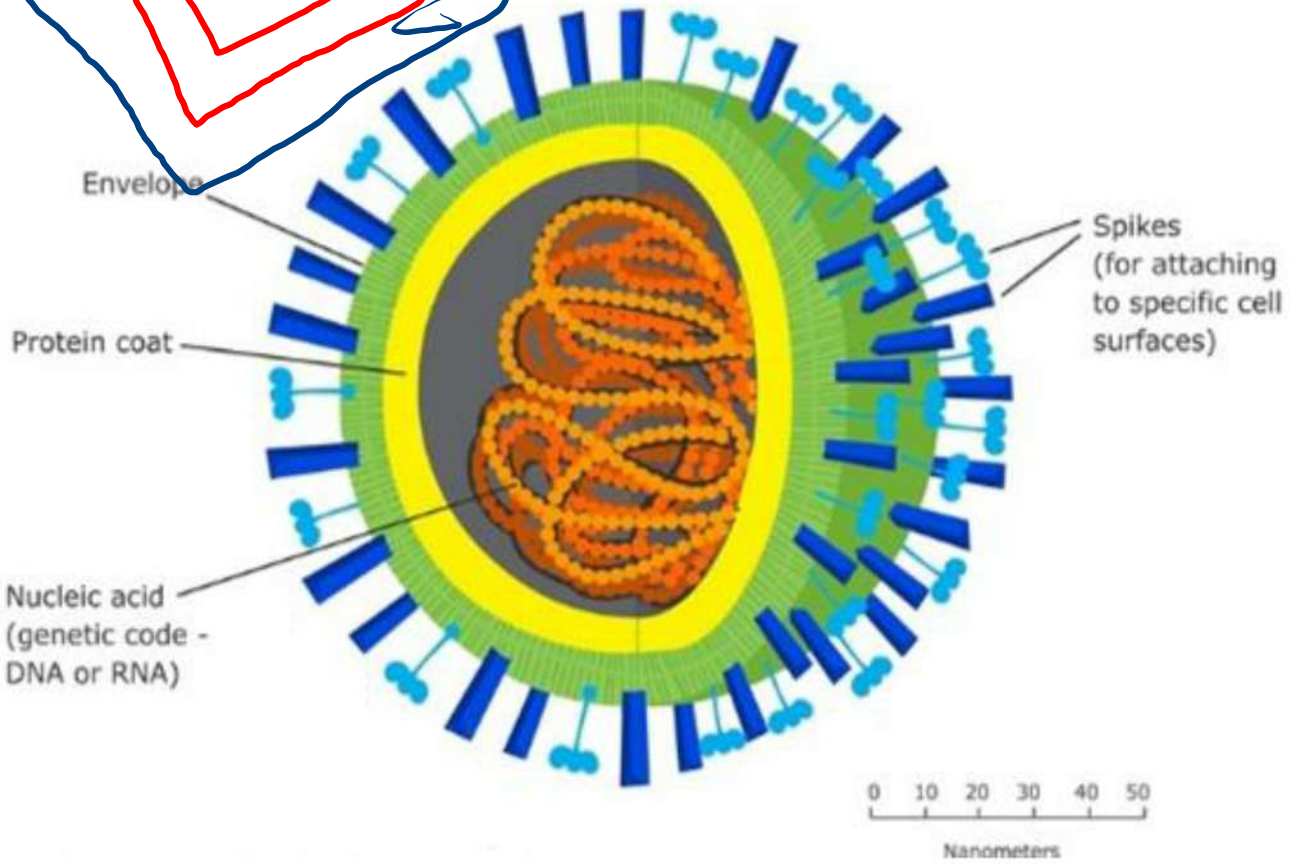
- Virus can multiply inside host cell.
- Newly formed virus contains property of ancestor virus.
- Structurally, virus contains nucleic acid (DNA or RNA).
- Virus is host-specific, obligatory parasite.
- Virus can undergo mutation and is able to create new variety.
- Genetic rearrangement is seen in virus.

Structure of Virus:



pc

Envelop / outer layer / Lipid or lipoprotein



i) **Nucleic Acid** (central body. Only DNA or RNA can be found)

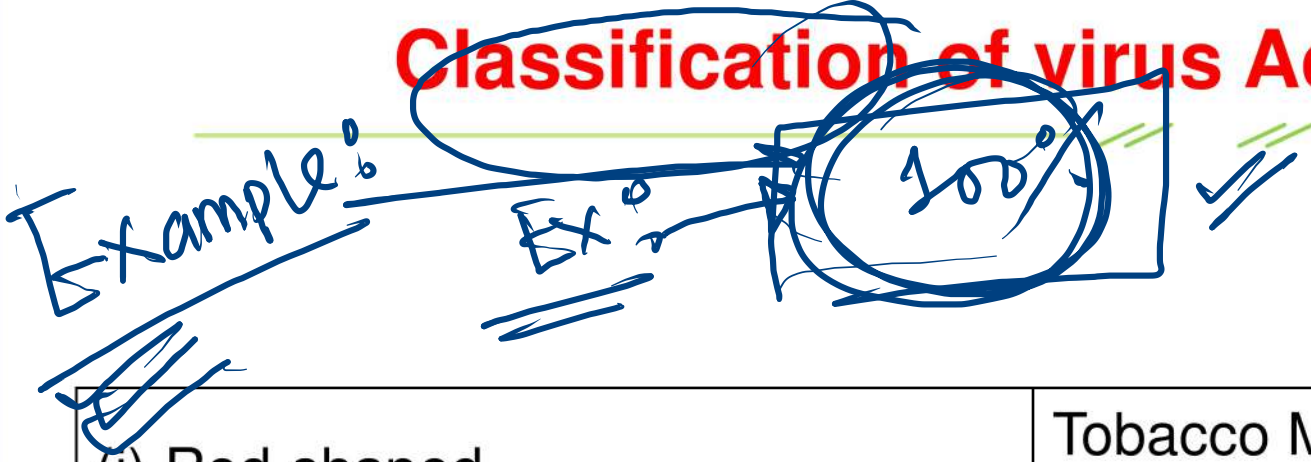
ii) **Protein (capsid).** Itis formed by subunit known as capsomere.

iii) **Outer layer**

Differently shaped virus

চিত্র ৪.১ : বিভিন্ন আকৃতির ভাইরাস।

Classification of virus According to shape:

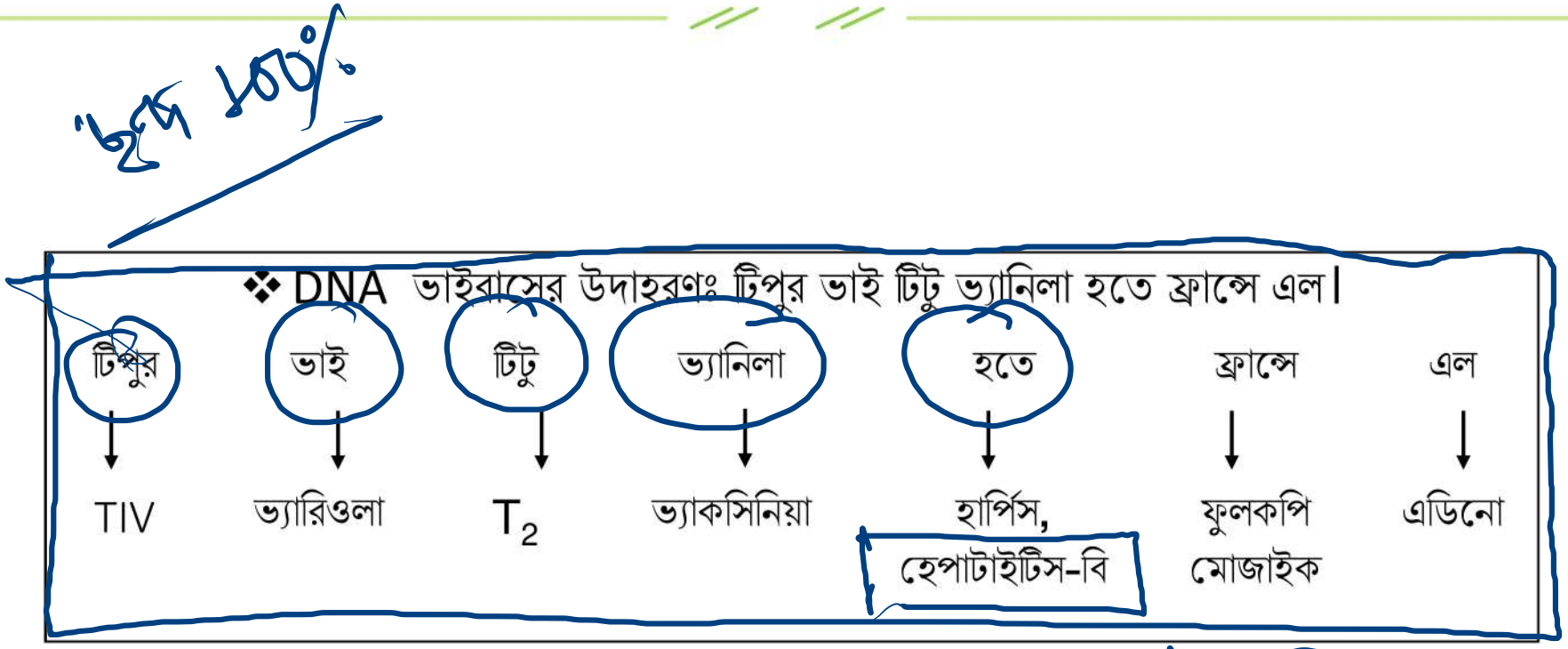


(i) Rod-shaped	Tobacco Mosaic Virus, Alpha Mosaic, TMV, Mumps Virus.
(ii) SPHERICAL	Polia virus, Dengue virus, HIV, TIV.
(iii) Cubic/bread size/polygonal	Herpes virus, Vaccinia virus.
(iv) Tadpole	T_2, T_4, T_6 virus.
(v) Oval	Influenza virus.
(vi) Cylindrical/Filmentous	Ebola Virus, Motor's Streak Virus.

Acoording to type of nucleic acid present

(i) DNA virus	● Vaccinia virus, T_2 virus, TIV, Adenoherpes Simplex, Variola etc. ● DNA of Parvoviridac family virus $(\varphi X_{174}\ and\ M_{13}\ coliphage)$ is single stranded.
(ii) RNA virus	● TMV, HIV, Dengue, Polio, Mumps, Rabies etc. ● RNA of Reoviridae family virus (Reo virus and virus of dwarf disease of paddy) is double stranded.

Pnemonic for DNA virus



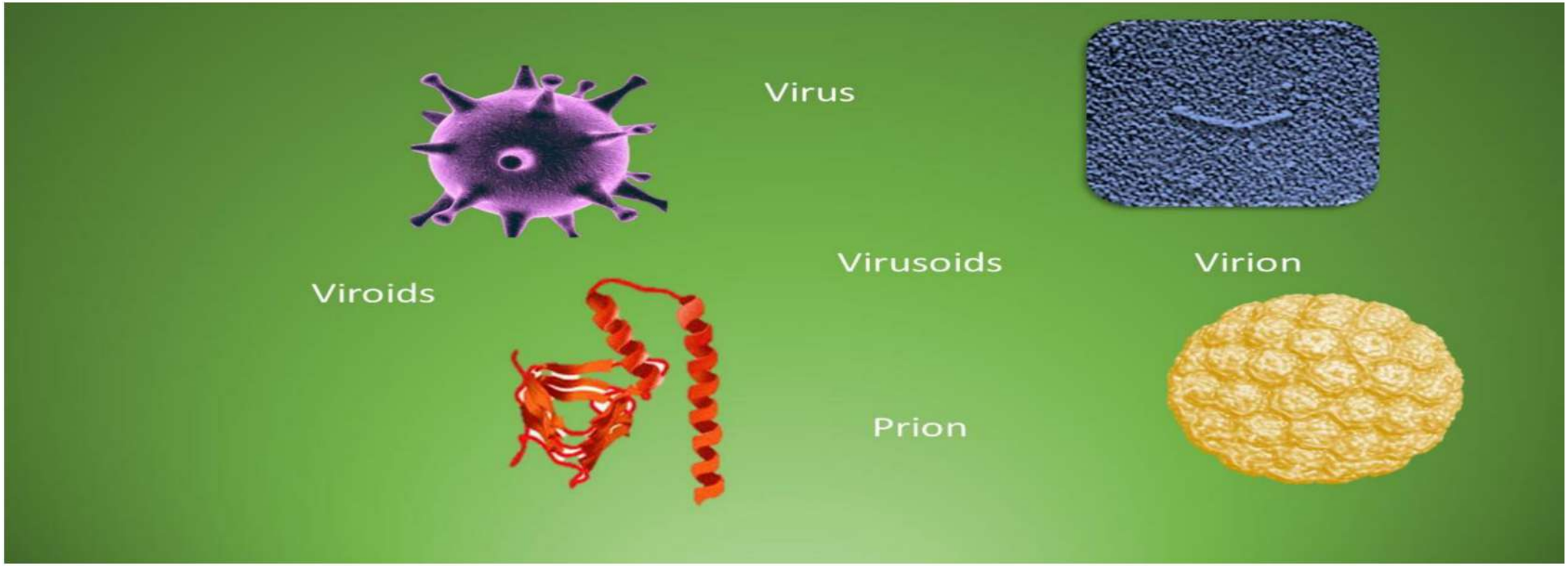
Hep
A — RNA
B → DNA
C — RNA
D — RNA
E — RNA

According to outer coating

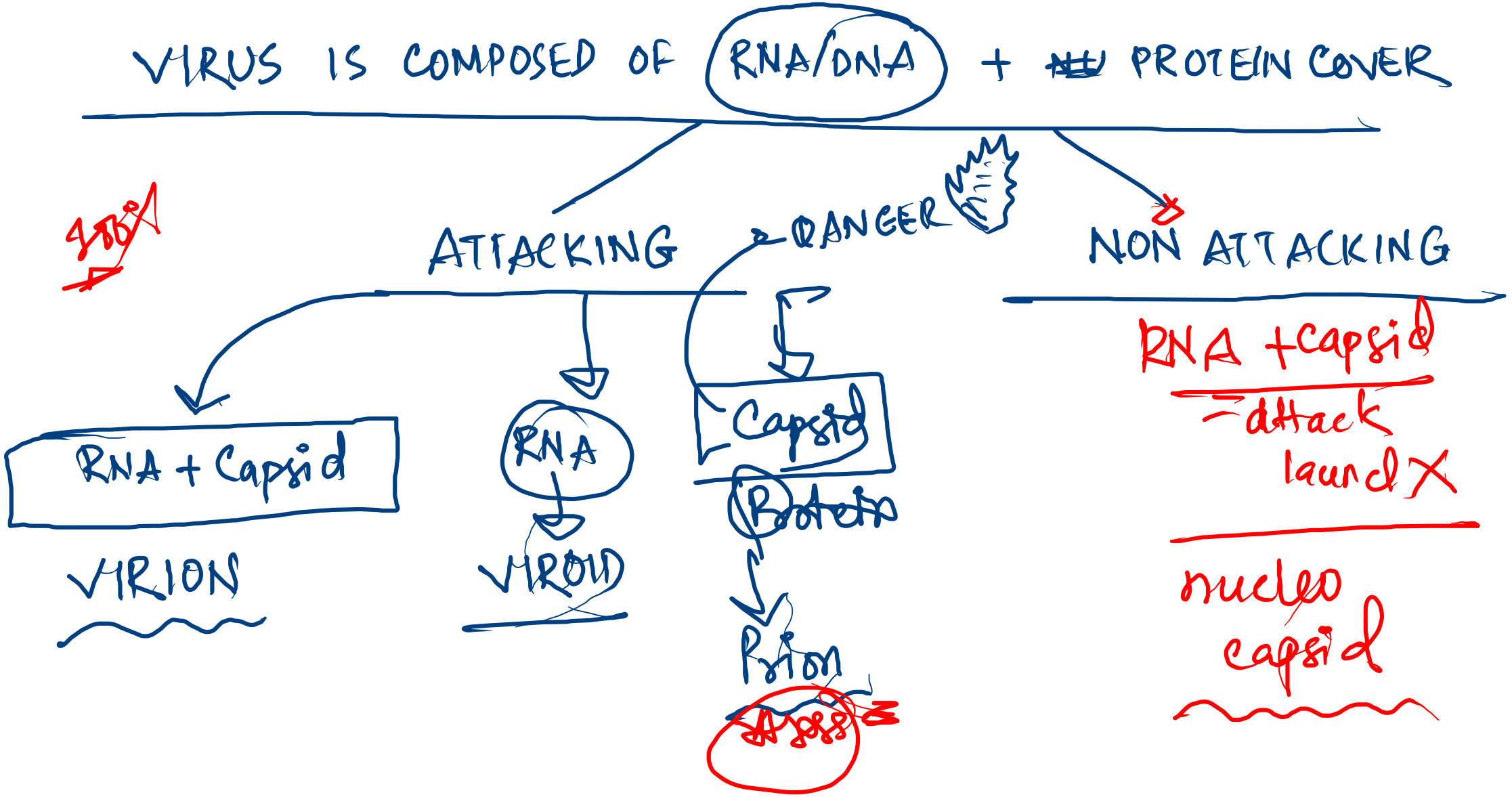
(i) Non-enveloped virus/naked virus	● TMV, T_2 virus,
(ii) Enveloped virus	● Influenza, Herpes, HIV virus (lipovirus etc).

RNA VIRUS VS DNA VIRUS

Traits	RNA virus	DNA virus
1. Shape	● They are usually rod shaped or stranded.	● They are usually spherical, tadpole shaped and bread shaped.
2. Nucleic acid	● Their nucleic acid core is RNA.	● Their nucleic acid core is DNA.
3. Infected organisms	● Most plant viruses and cyanophage are RNA virus.	● Most animal viruses and bacteriophage are DNA virus.
4. Stand	● RNA of most viruses are single stranded; except paddy dwart disease virus and reo virus RNA are double stranded.	● DNA of most viruses are double stranded; except-ΦX_{174} and M_{13} coliphage virus DNA are single stranded.
5. Disease	● Most RNA viruses cause disease in the plant.	● Most DNA viruses cause disease in the animal.
6. Envelop	● Generally envelope is not present.	● Generally envelope is present outside of capsid.
7. Example	● Tobacco Mosaic Virus (TMV), Potato X Virus, Sugarcane Mosaic, Turnip Mosaic, Alpha-Alpha mosaic, Rabies, Polio, Dengue, Yellow fever, Mumps, Measles, Influenza-B, Encephalitis etc. RNA Virus.	● T_2 Virus, Vaccinia, Variola, TIV (Tipula Iridescent Virus) Adenoherpes Simplex, virus etc. are DNA Virus.



Virion: The complete, infective form of a virus with a core of nucleic acid surrounded by capsid is called virion.
Nucleocapsid: The non-infectious virus is called nucleocapsid.


VIRUS IS COMPOSED OF
RNA/DNA
+
PROTEIN COVER
ATTACKING
RANGER
NON ATTACKING
RNA + Capsid
VIRION
RNA
VIROID
Capsid
Protein
Prion
RNA + capsid
= attack
launch X
nucleo
capsid

Viroid:

Single stranded, circular RNA..
It can cause disease only in plants.
It is the causative agent of Cadang disease I coconut trees.

Prion:
It is a nucleic acid less protein shell.
Prion causes Kuru and Creutzfeldt disease of central nervous system of humans and Scrapie disease of sheep and goat.

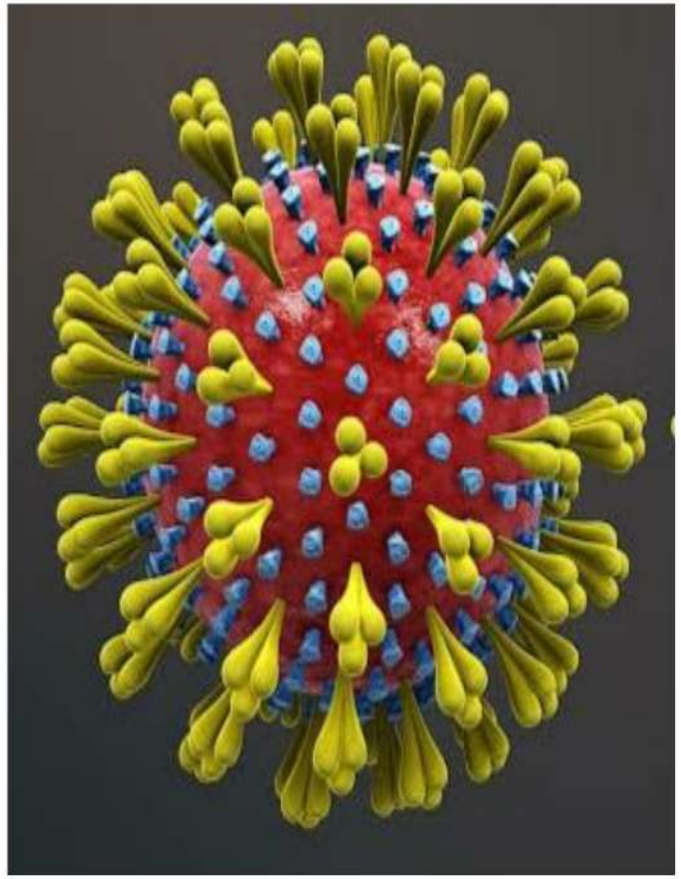
Association of prion with the widely discussed “Mad Cow” disease of cow has been found.

VIRUS → HOST "X" → "Y"

Emerging Virus: Virus that can cause disease from primary host to new host. Example: **HIV, SARS, Nile virus, Ebola etc.** COVID 19 DISEASE

NEW EMERGING VIRUS SARS COV -2

- Name of the virus is SARS CORONA VIRUS (COV)-2
- It is the causative agent of the disease COVID 19 in human
- Its is a RNA VIRUS.
- This virus attacksand multiplicates in respiratory system
- It caused a pandemic outbreak through the world

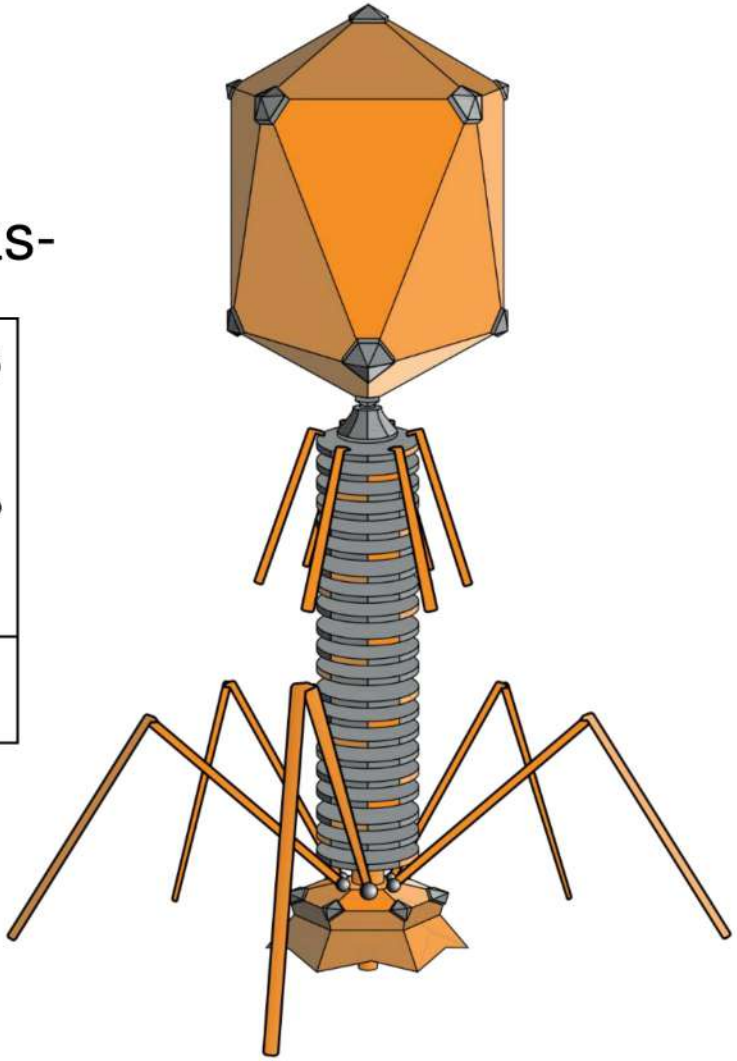


T2 Bacteriophage:

NSI ⇒ Not so Important

- T2 virus particle can be divided into two parts. Such as-

Head	• Length is almost 93-100nm and width is 65nm. • DNA is composed of 60,000 base pairs (50% of total weight) and it contains 150 gene.
Tail	• Length is 95-110nm and width is 15-25nm.



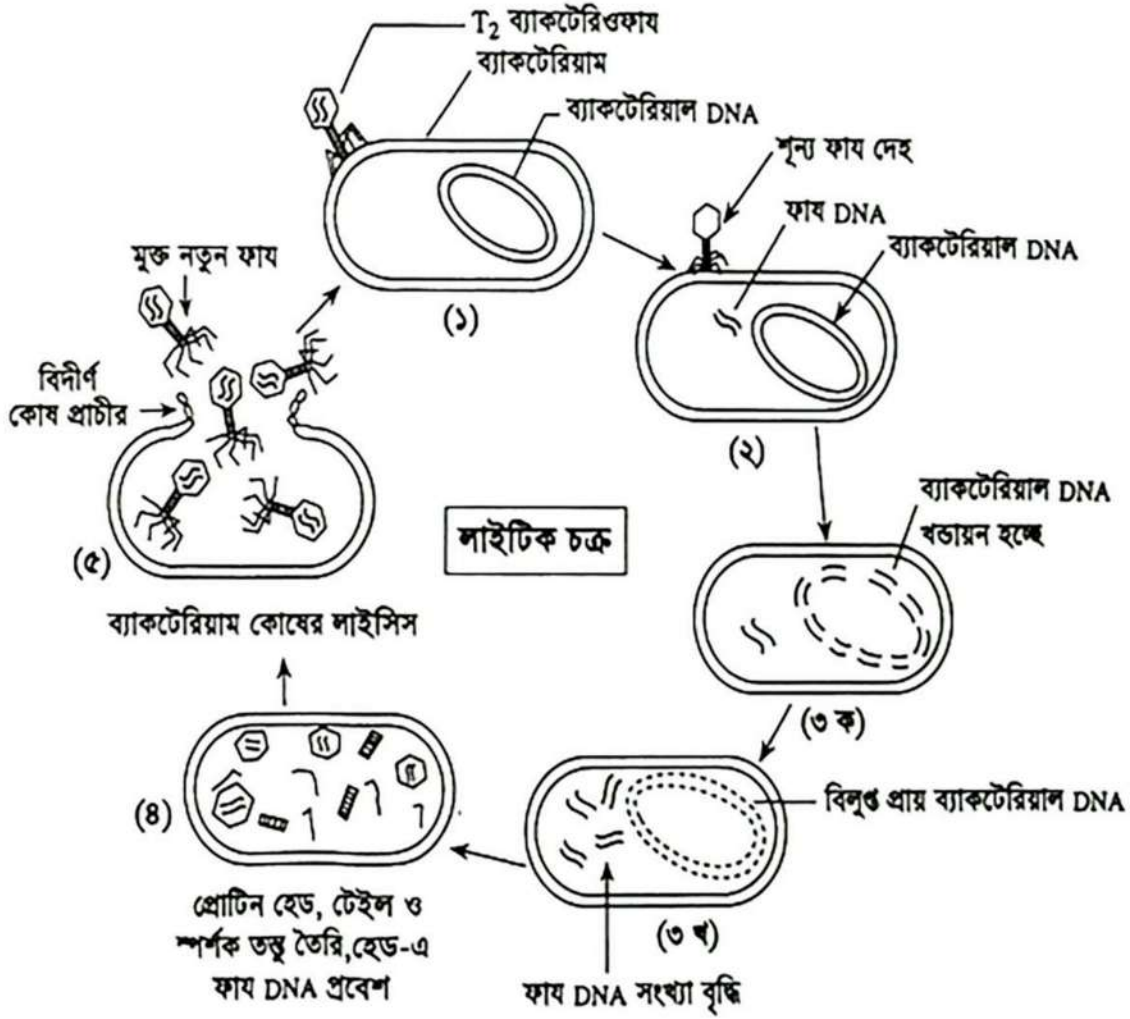
Replication cycle of virus:

Lytic cycle

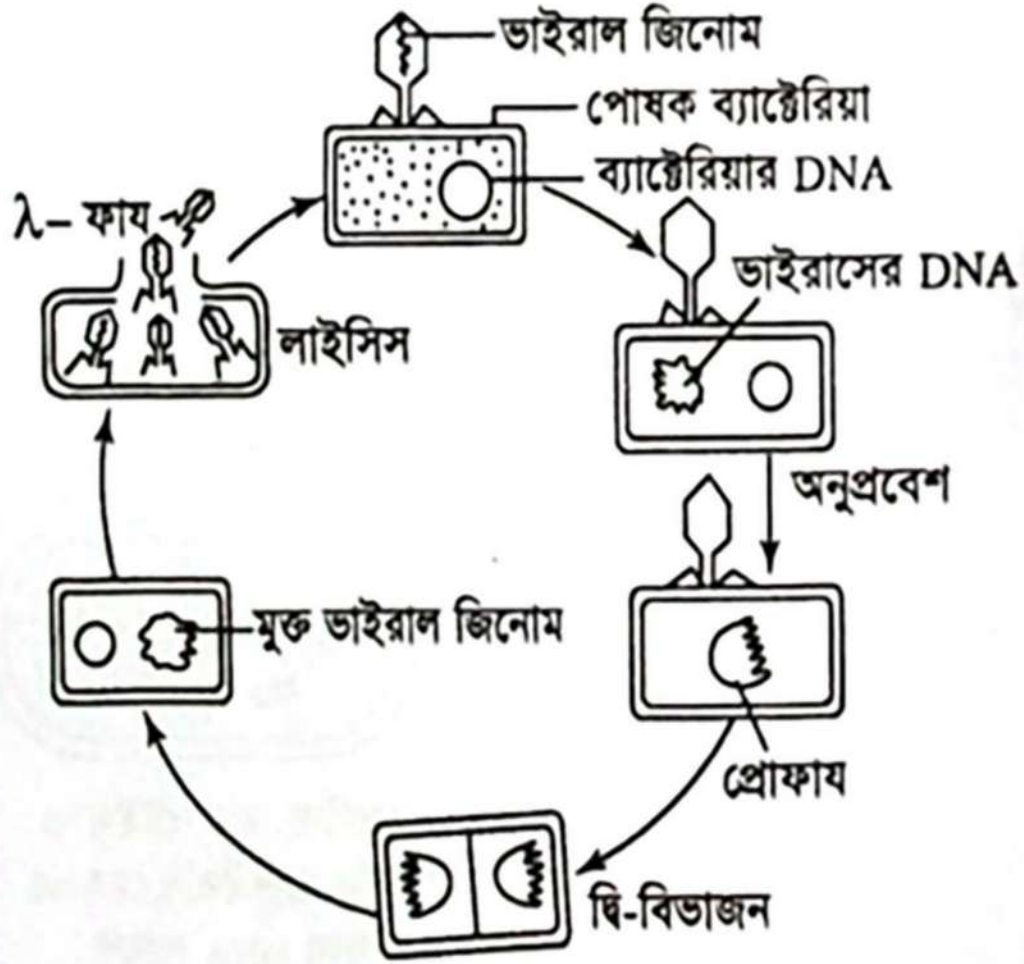
- Step-1: Attachment/ Lnading: T_2 bacteriophage attacks E. coli.
- Step-2: Entry of phage DNA (Penetration)
- Step-3: Replication
- Step-4: Assembly of virus paricles (Assemble)
- Step-5: Release of new virus (Release)

Lysogenic cycle

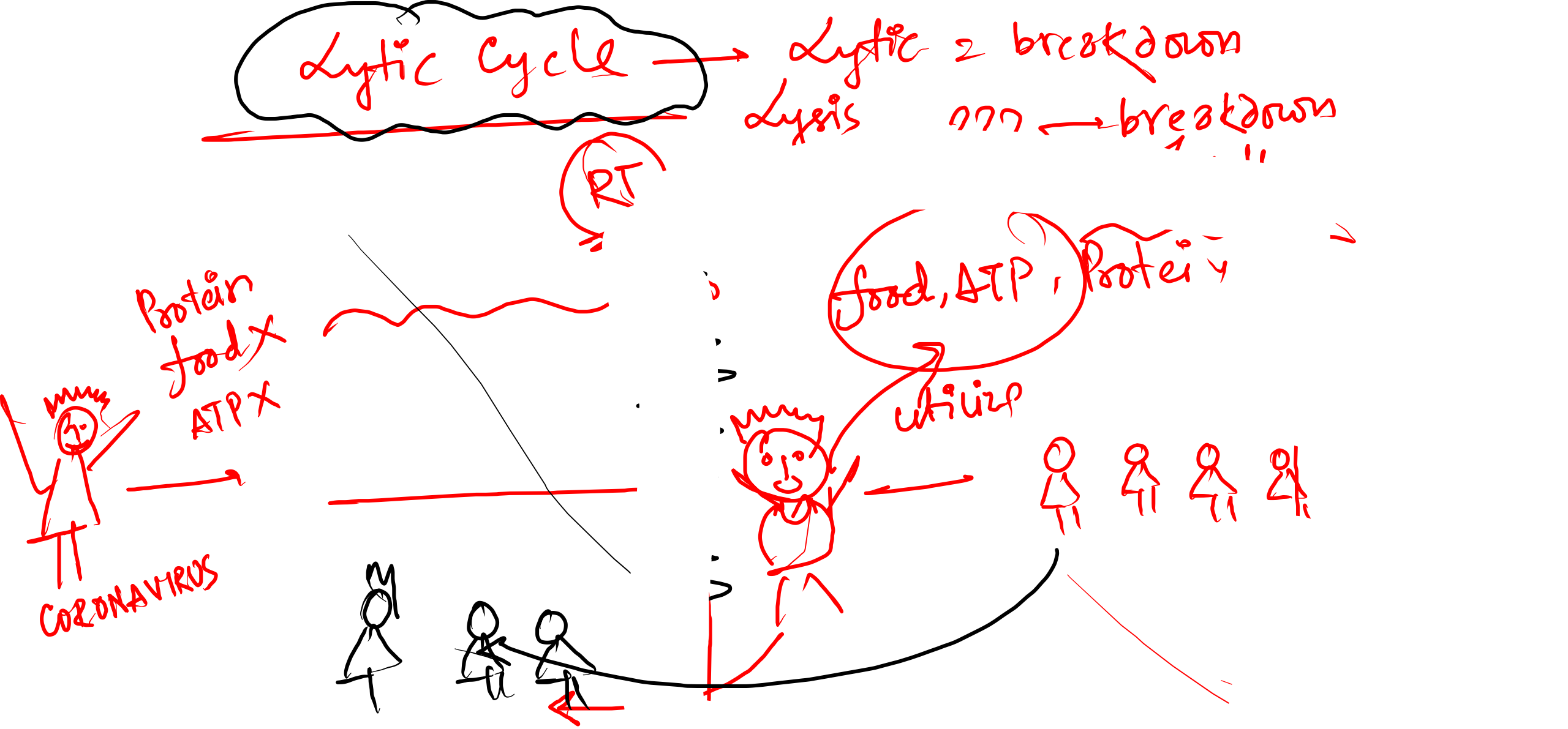
It is seen in lambda phage that infects *E. coli*.
In this cycle, phage DNA enters *E. coli.* Rather than destroying host DNA, it gets integrated into *E. coli* DNA.



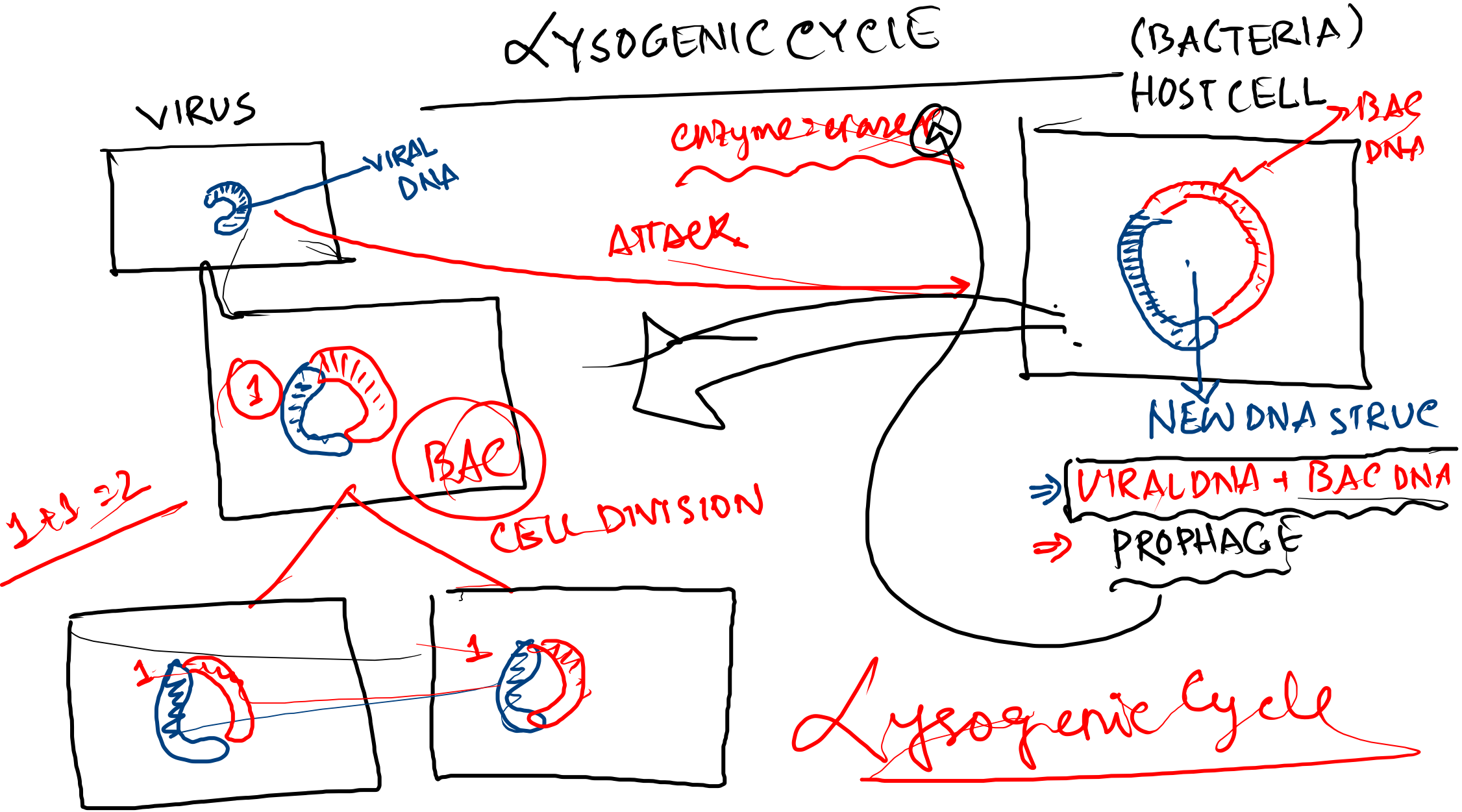
চিত্র ৪.৪ : T_2 ব্যাকটেরিওফায-এর লাইটিক চক্র।



চিত্র ৪.৫ : লাইসোজেনিক চক্র


Lytic Cycle
Lytic = breakdown
Lysis = breakdown
RT
Protein
food
ATP
CORONAVIRUS
food, ATP, Protein
utilize

LYSOGENIC CYCLE



Difference Between lytic and lysogenic cycle

Ciriteria	Lytic cycle	Lysogenic cycle
1. Structural	● Phage bacteria enters into bacteria cell to multiply and ruptures the cell	● After entering a bacteria cell, the viral DNA joins with the bacterial DNA and gets replicated together.
2. Lysis	● Ruptures out of the bacteria as a full virus through lysis.	● Doesn't rupture out of the bacteria through lysis.
3. Different	● Lytic cycle is seen in T-series phage.	● Lysogenic cycle is seen in λ- series phage.
4. Creation	● Numerous virus are created in a single cycle	● Only two bacteria with viral genome is created in a single cycle.
5. Control	● The multiplication of virus is controlled by the virus.	● The multiplication of viral DNA IS controlled by the host bacteria.
6. Prophage formation	● Not formed.	● Formed.
7. Intensity of attack	● Attack is extreme or virulent.	● Host cell does not die so attack is mild or temperate.

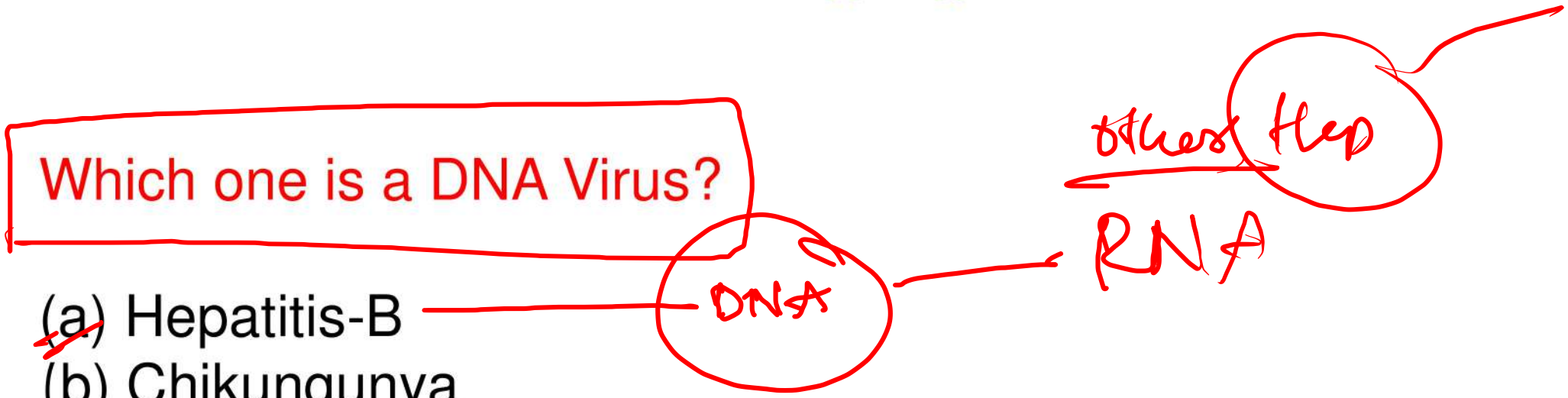
Which of the following comprises virus? (MAT: 09-10)

(a) Lipid and nucleic acid
(b) Onl nucleic acid
(c) Protein and lipid
(d) Protein and nucleic acid

Poll Question: 01

Which one is a DNA Virus?

(a) Hepatitis-B
(b) Chikungunya
(c) Tobacco mosaic
(d) Dengue



Poll Question: 02

Which of the following is not an example o RNA virus?

(a) Mumps virus
(b) Rabies virus
(c) Polio virus
(d) Variola virus

Benefits of Virus:

(i) As vaccine	● Vaccines of pox, polio, rabies, plague, hepatitis/jaundice disease are produced.
(ii) As medicine	● Production of medicines of Cholera, typhoid, dysentery, plague etc.
(iii) To enhance beauty	● White spots are seen on red tulip flowers when attacked by virus. It is called a broken tulip.
(iv) As an insecticide	● In the United States NPV (Nuclear Polyhydrosis Virus) is applied as insecticide.
(v) Rabbit control	● Myxovirus is used in Australia.
(vi) Genetic Engineering	● The virus is used as a carrier.
(vii) Controlling harmful bacteria	● Bacteriophage is used in the virus.

Vaccine made by virus

❖ ভাইরাস দিয়ে তৈরি টিকাঃ জনে জনে পাশে বসে টিকা খাই।

জনে	জনি	পাশে	বসে	টিকা খাই
↓	↓	↓	↓	
জন্ডিস	জলাতঙ্ক	পোলিও/প্লেগ	বসন্ত	

Disease caused by virus

❖ ভাইরাসঘটিত রোগঃ হায় হায় দেশে বসন্ত মাস এলো ভাইকে ইনফ্লুয়েঞ্জা ডেঙ্গু জ্বরে পেল।

হায় হায়	দেশে	বসন্ত	মাস	এলো	ভাইকে	ইনফ্লুয়েঞ্জা	ডেঙ্গু	জ্বরে	পেল
↓ ↓		↓	↓	↓	↓	↓	↓	↓	↓
হাম হার্পিস হেপাটাইটিস		বসন্ত	মাম্পস	এইডস	ভাইরাল	ইনফ্লুয়েঞ্জা	ডেঙ্গু	জলাতঙ্ক	পোলিও

Disadvantages of Virus:

Name of the disease	Virus
AIDS	HIV
Dengue	Flavi virus of dengue virus
Neonatal Microcephaly	Zika Virus
Chikungunya	Chikungunnya Virus
Bird flu	Influenza (H_5N_1) virus

Name of the disease	Virus
SARS	Nipah virus
Rabies	Rabies virus
Smallpox	Variola virus
Chickenpox	Varicella Zoster virus
Cell lysis	Ebola virus

Viral Hepatitis

- Viral hepatitis is an inflammatory disease of liver.
- HAV and HEV spread by water. The rest spread by blood.
- Most hepatitis is caused by HBV.
- HCV is called silent killer.
- Liver cirrhosis, liver cancer is caused by hepatitis B and C virus.

Characteristics of Hepatitis Virus					
Characteristics	HAV	HBV	HCV	HDV	HEV
Virus group	Enterovirus	Hepadna virus	Flavi virus	Incomplete virus	Calici virus
Nucleic acid	RNA	DNA	RNA	RNA	RNA
Size	27 nm	42 nm	30-38 nm	35 nm	27 nm
Latent period	14-28 days	45-180 days	14-180 ays	21-49 days	21-56 days

Dengue Fever:

Aedes aegypti, Aedes albopictus (RNA Virus)

i) General dengue fever	● Symptoms include rash, back pain, high fever and pain in eye orbit ● serology test features the presence of **IgM antibody**
ii) Hemorrhagic dengue fever	❖ Bleeding is seen in nose, mouth, jaw and skin of patient. ❖ Platelets reduce drastically in blood and blood cannot clot.
iii) Dengue shock syndrome	❖ Hemoconcentration is seen.

Some disease caused by virus:

Chikungunya: It is an RNA virus. Its carrier include *Aedes aegypti, A. albopictus.* This virus was first discovered in Tanjania of Africa.

Symptoms: High fever, joint pain, body rash, headache, weakness etc.

Papaya ringspot or mosaic disease: Papaya ringspot virus or PRSV. This virus has two serotypes. (P type & W type)

Nipah virus caused disease: It is an RNA virus of family Paramyxoviridae. Its carrier is bat. This virus can spread into human body through raw date juice.

Zika virus caused disease: It is an RNA virus. Its carrier include *Aedes aegypti, A. albopictus.* It can cause microcephali in newborn by infecting pregnant mother.

Which carrier transmits Zika virus into human body? (DAT: 16-17)

(a) Aedes male
(b) Aedes female
(c) Anopheles male
(d) Anopheles female

Which plant is infected by Tungro virus? (MAT: 13-14)

(a) Rice
(b) Wheat
(c) Corn
(d) Pea

Poll Question: 03

Which virus cause dengue?

(a) Flavi
(b) Ebola
(c) Adeno
(d) Poty

Bacteria:

- Single celled, prokaryotic, smallest simple microscopic life form containing cell wall.

- Prokaryotic.
- Primary component of cell wall is peptidoglycan/mucoprotein along with muramic acid and teichoic acid.
- They are very sensitive to phage virus.
- Some of them are obligate anaerobes, meaning cannot survive in presence of oxygen. Ex: *Clostridium.* Some are facultative anaerobes, meaning can survive even in presence of oxygen. Some are obligate aerobes, meaning cannot survive without oxygen. Ex: *Azotobacter beijerinckia.*
- They can thrive from -17° to 80° C.
- They can survive up to 50 years in adverse condition by forming endospores.
- Mitosis and meiosis do not occur as they have no chromosome.

Structure of Bacteria:

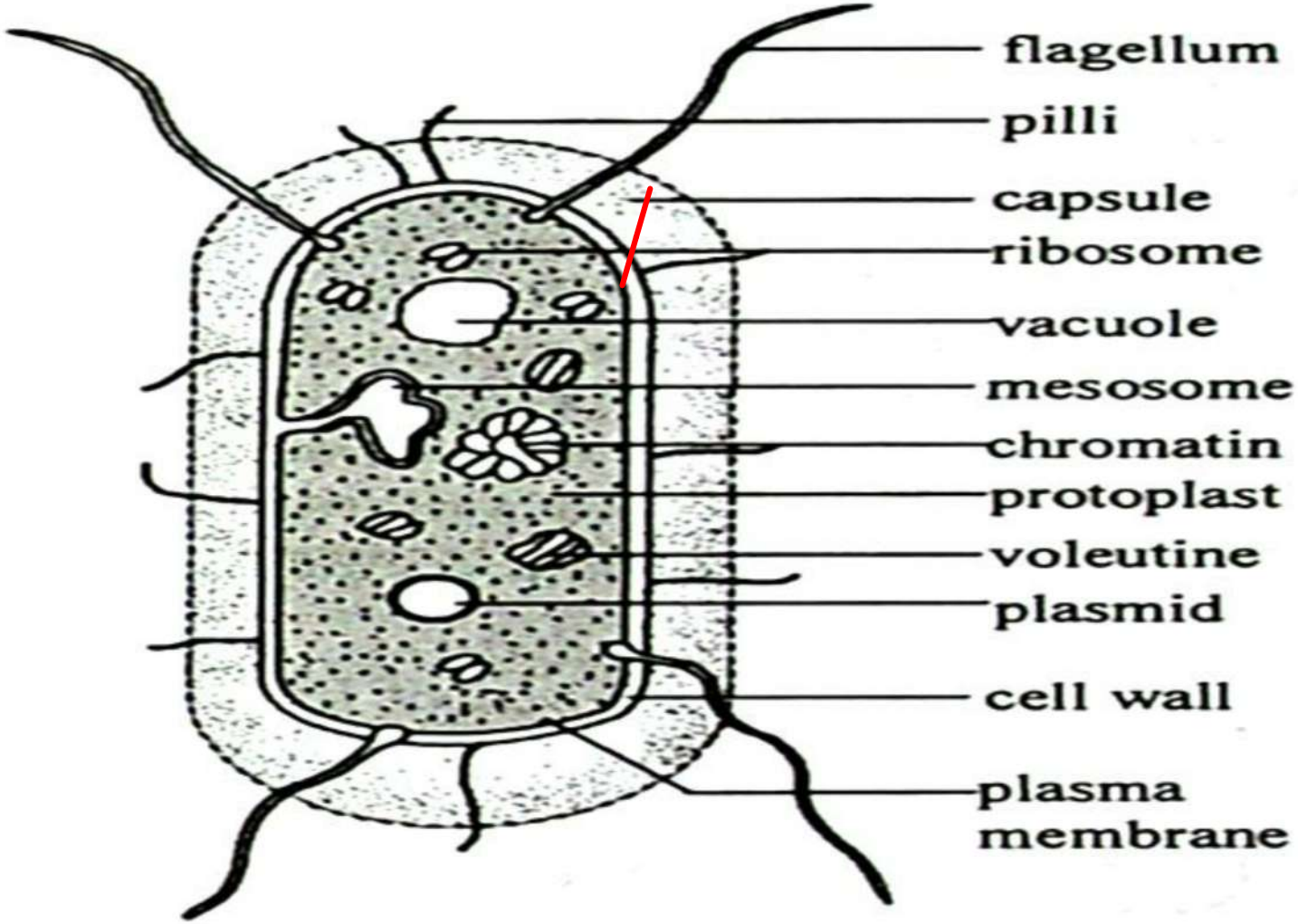
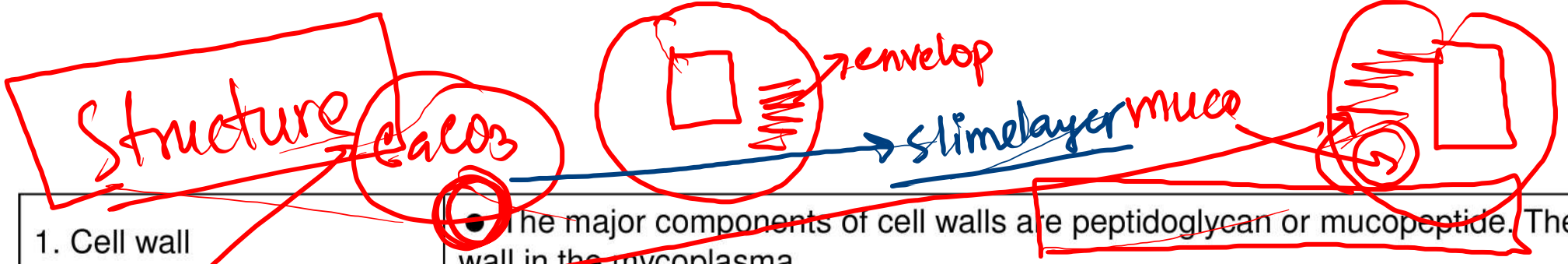
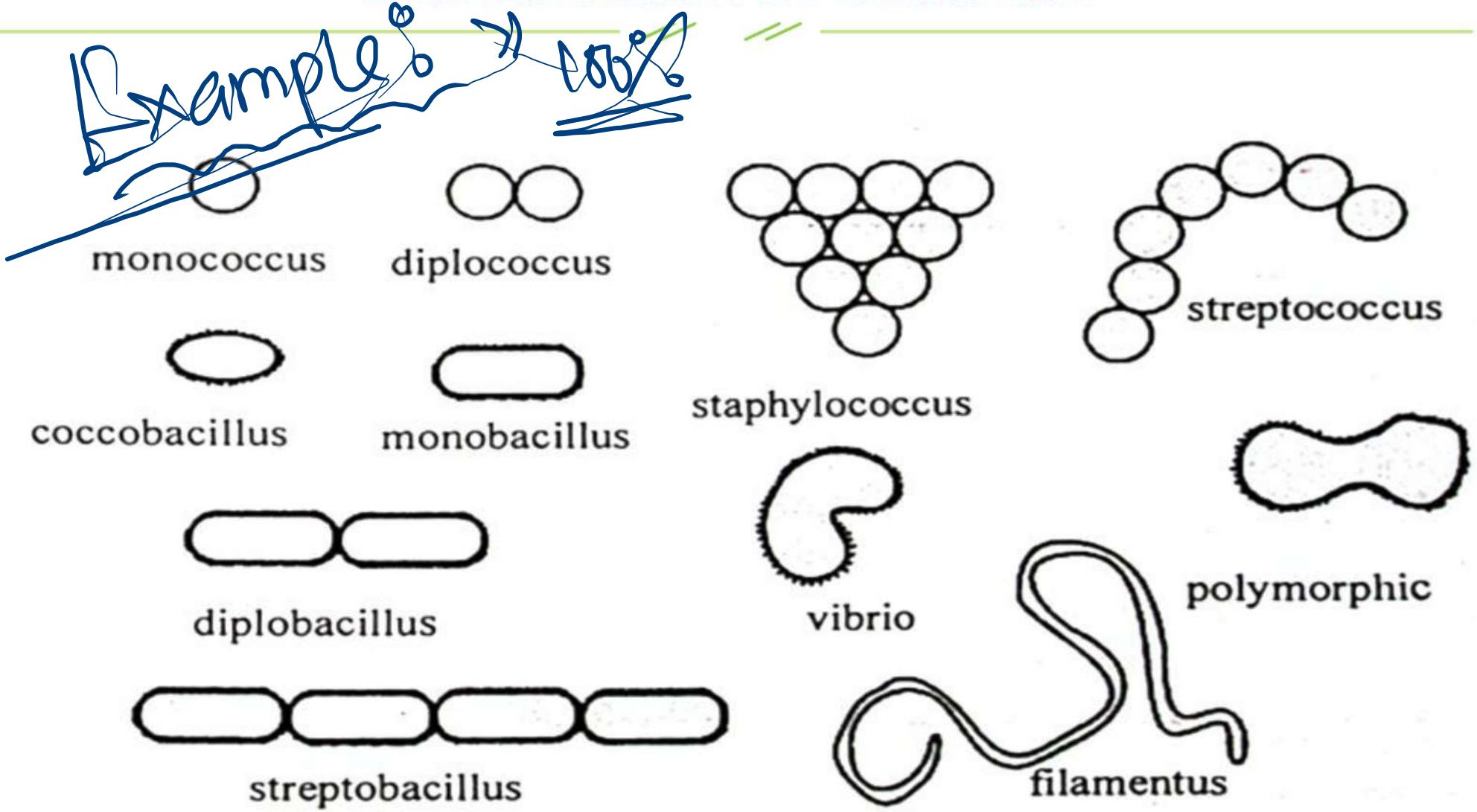


Fig 4.10 Structure of a typical bacterium



1. Cell wall	● The major components of cell walls are peptidoglycan or mucopeptide. There is no cell wall in the mycoplasma.
2. Capsule	● It's main function is to protect bacteria from adverse conditions. It is called slime layer.
3. Flagella	● Made of one type of protein called Flagellin. ● Each flagellum has three parts. (A) strand (B) short hook and (c) basal body.
4. Pili	● Made up of a type of protein called pilin. Pili acts to attach to the host cell, e.g.- Gonorrhea.
5. Plasma membrane	● Participates in metabolic activities.
6. Mesosome	● Mesosomes help in cell division.
7. Cytoplasm	● The significant organelles in the cytoplasm are free ribosomes and polyribosomes. ● Chromatophore is usually not present. However, chromatophore is present in the cytoplasm of photosynthetic bacterial. ● Volutin is present in cytoplasm of young bacteria.
8. Chromosomes	● DNA- rich areas are called nucleoid.
9. Plasmid	● Many bacteria have circular chromosomes which are called plasmids. These are used as vector.

Classification of Bacteria:



(a) Based on shape:

1. Coccus	Micrococcus: Micrococcus denitrificans, M. flavus Diplococcus: Diplococcus pneumoniae Tetracoccus: Gaffkya tetragena Streptococccus: Streptococcus lactis Staphylococcus: Staphylococcus aureus
2. Bacillus	Monobacillus: Bacillus albus, E. coli. Diplobacillus: Moraxella lacunata Streptobacillus: Bacillus tuberculosis, Streptobacillus monilliformis Coccobacillus: Salmonella, Mycobacterium Palisade bacillus: Lampropedia sp.
3. Spirillum	Spirillum minus
4. Vibrio	Vibrio cholera
5.Pleomorphic	Rhizobium sp.
6. Stellate	Stella sp.
7. Square	Haloquadratum walsbyi
8. Filamentus	Candidatus. Savagella
9. Hypha	Streptomyces scabies

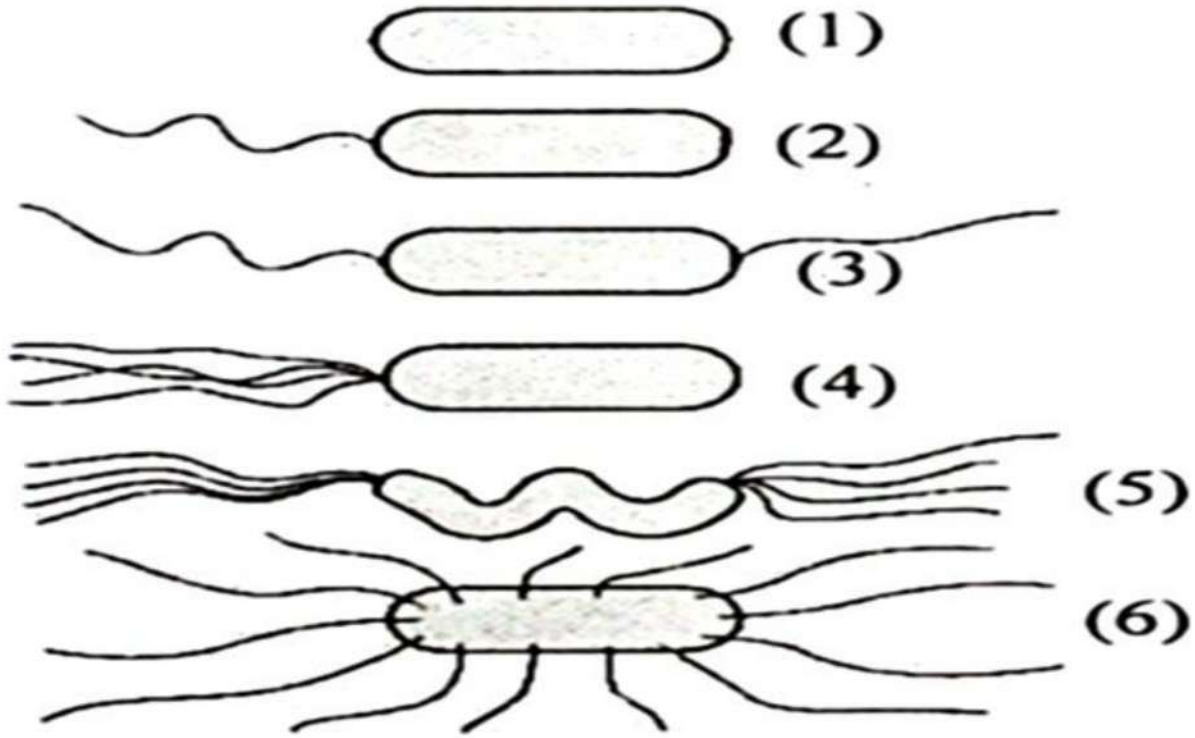


Fig 4.9. Different type of bacteria based on number and distribution of flagella.

(b) Based on presence, position and number of Flagella:

i) Atrichous	• Without flagella; *Corynebacterium diptheriae*
ii) Monotrichous	• Single flagellum at one end; *Vibrio cholera*
iii) Lophotrichous	• Tufts of flagella at both ends; *Spirillum volutans*
iv) Amphitrichous	• Single flagellum at both ends; *Spirillum serpentans, Spirillum minus*
v) Peritrichous	· Flagella all around; *Salmonella typhi, Bacillus typhosus*
vi) Cephalotrichous	· Tuft of flagella at one end; *Pseudomonas fluorescens*

(c) Pigment based classification:

i) Gram positive	• Will retain violet color of Crystal Violet upon staining. • Example: *Bacillus subtilis.*
ii) Gram negative	• After staining, these will lose violet color on washing and retain red color of safranin after wash. • Example: *Salmonella typhi.*

(d) Based on Oxygen Requirement:

(i) Aerobic	These do not survive without free oxygen in air; *Azotobacter beijerinckia.*
(ii) Anaerobic	These survive without free oxygen in air; *Clostridium.*

Replication of Bacteriat

(i) Vegetative	(a) Binary fission (Main reproductive process) (b) Budding
(ii) Asexual (Occurs via spores)	(a) Gonidia: Leucothris (b) Endospore: Bacteria of Bacillaceae family
(iii) Sexual	(i) Along the conjugation tube (ii) Transformation (iii) Transduction

Poll Question: 04

Which of the following bacteria can survive without free oxygen?

(a) Azotobactor
(b) Bacillus
(c) Clostridium
(d) Staphylococcus

Poll Question: 05

What is bacterial cell wall primarily made of?

(a) Muramic acid
(b) Chitin
(c) Mucoprotein
(d) Cellulose

Economic Importance of Bacteria

Beneficial effects :

In medical field00	● To make antibiotic drugs: Subtilin (from Bacillus subtilis), Polymyxin (from Bacillus polymyxa), Streptomycin (from Actinomycetes), Teramycin. ● To prepare vaccines: Cholera, typhoid, tuberculosis, DPT (diphtheria, whooping cough or pertussis and tetanus) etc. vaccines.
In agricultural sector	● Nitrogen fixation: Azotobacter, Pseudomonus, Clostridium fix N_2 to the soil. ● Rhizobium fixes nitrogen to the nodules of the plants like green beans. ● As pesticide: Bacillus thuringiensis. ● Nitrification: Nitrosomonas, Nitrococcus & Nitrobacter work as nitrifying bacteria.
In industrial sector	● Manufacturing tea, coffee and tobacco: Bacillus megaterium. ● In dairy farm: Streptococcus lactis, Lactobacillus produce butter, cheese etc from milk. ● In jute industry: Clostridium. ● In tannery: Bacillus. ● Chemical industry: Acetobacter xylinum in production of vinegar ● Produces lactic acid: Bacillus lacticacidi. ● Produces acetone: Clostridium acetobutylicum.
In human life	● Cellulose digestion: Domestic animals have bacteria in their stomach for the digestion of cellulose. ● Vitamin synthesis: E. coli and other bacteria in the human intestine synthesize vitamin B, Vitamin-K, folic acid, biotin etc. ● Genetic engineering: Agrobacterium, E. coli.

Disadvantages of Bacteria:

Name of Disease	Bacteria
Tuberculosis	*Mycobacterium tuberculosis*
Typhoid	*Salmonella typhi*
Dysentry	*Bacillus dysenteri*
Tetanus	*Clostridium tetani*
Diphtheria	*Corynebacterium diptheriae*
Anthrax	*Bacillus anthracis*
Gonorrhea	*Neisseria gonorrhoeae*
Syphilis	*Treponema pallidum*
Chlamydia	*Chlamydia trachomatis*
Spike blight of wheat	*Agrobacterium tritici*
Blight of tobacco	*Pseudomonas tabacci*
Canker of tomato	*Corynebacterium michiganese*
Canker of lemon	*Xanthomonas citri*
Scab of potato	*Streptomyces scabies*

CHOLERA

- causative agent is ***Vibrio cholera.*** Its a comma shaped bacteria
- It has a flagellum at one end.
- Robert Koch discovered this
- It attacks the mucose of small intestine and secrets an **endotoxin** known as **CHOLERAGEN TOXIN**
- This disease causes electrolyte imbalance in the host.
- **ORS SALINE** is the best treatment procedure

Difference between Virus and Bacteria:

Traits	Virus	Bacteria
1. Nature	● Acellular, no nucleus present	● Cellular, primitive nucleus present.
2. Size	● Ultramicroscopic (0.01-0.3 micrometer).	● Microscopic (0.2-50 micrometer).
3. Reproduction	● Can't reproduce outside any living cell.	● Can reproduce outside a living cell as well.
4. Crystallization (Separate solid substance from liquid solution)	● Show signs of life when introduced into living cells after being crystallized	● Does not show signs of life after being crystalized.
5. Presence of cell organelles	● No cytoplasm or cellular organelle nor any metabolic process.	● Cytoplasm and other small orgenelles preset; metabolism occurs
6. Presence of enzymes	● No enzyme present.	● Enzyme present in body.
7. Presence of nucleic acid	● Nucleic acid is present within capsid.	● Nucleic acid does not reside within the capsid.
8. Type of nucleic acid	● Either DNA or RNA present.	● Both DNA and RNA present.

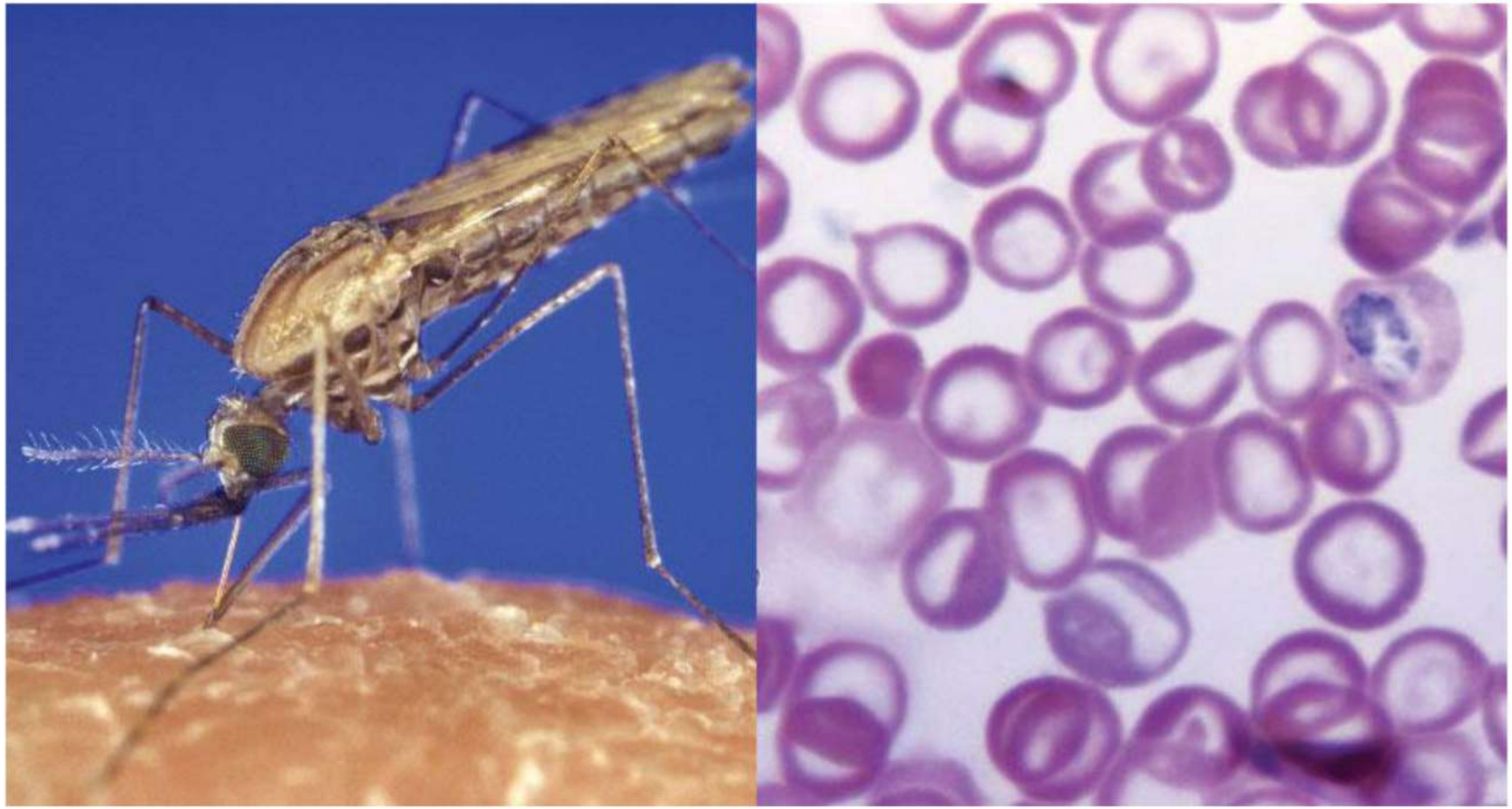
Which of the following vitamin is not synthesized by *E. coli*? (DAT: 18-19)

(a) Vitamin - B_2
(b) Vitamin - E
(b) (c) Vitamin - K
(d) Vitamin - B_{12}

Which bacteria is responsible for sexually transmitted disease? (DAT: 16-17)

(a) *Vibrio cholerae*
(b) *Clostridium tetani*
(c) *Diplococcus pneumoniae*
(d) *Chlamydia trachomatis*

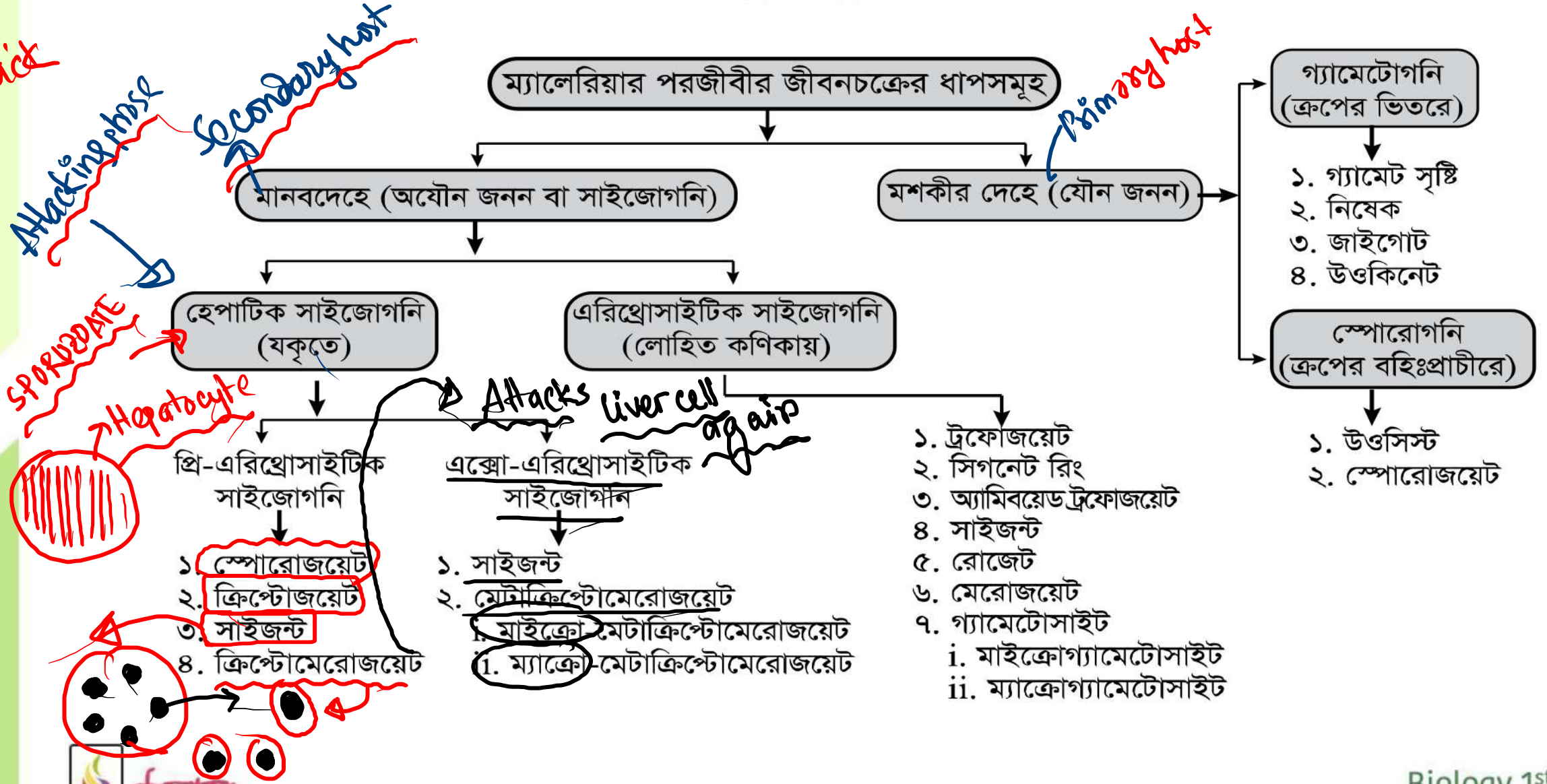
Malarial Parasite

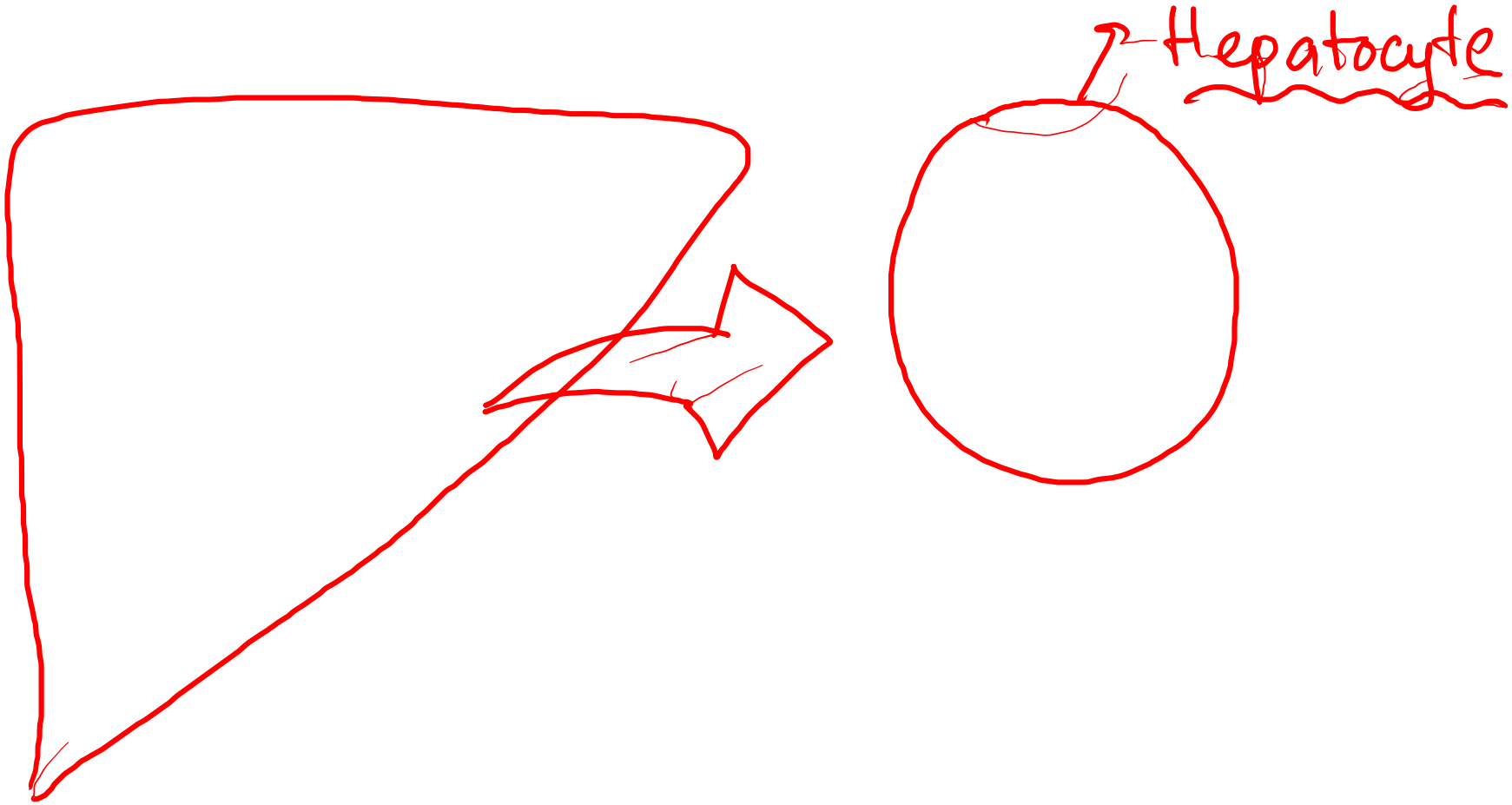


Different species of Malarial Parasite and names of fever:

Name of malarial parasite	Name of disease	Nature of fever	Latency period
Plasmodium falciparum	Malignant tertian malaria	Fever comes after 36-48 hours	8-15 days
Plasmodium malariae	Quartan malaria	Fever comes after 72 hours	18-40 days
Plasmodium vivax	Benign tertian malaria	Fever comes after 48 hours	12-20 days
Plasmodium ovale	Mild tertian malaria	Fever comes after 48 hours	11-16 days

Life Cycle of Malarial Parasite:




Hepatocyte

Hepatic schizogony

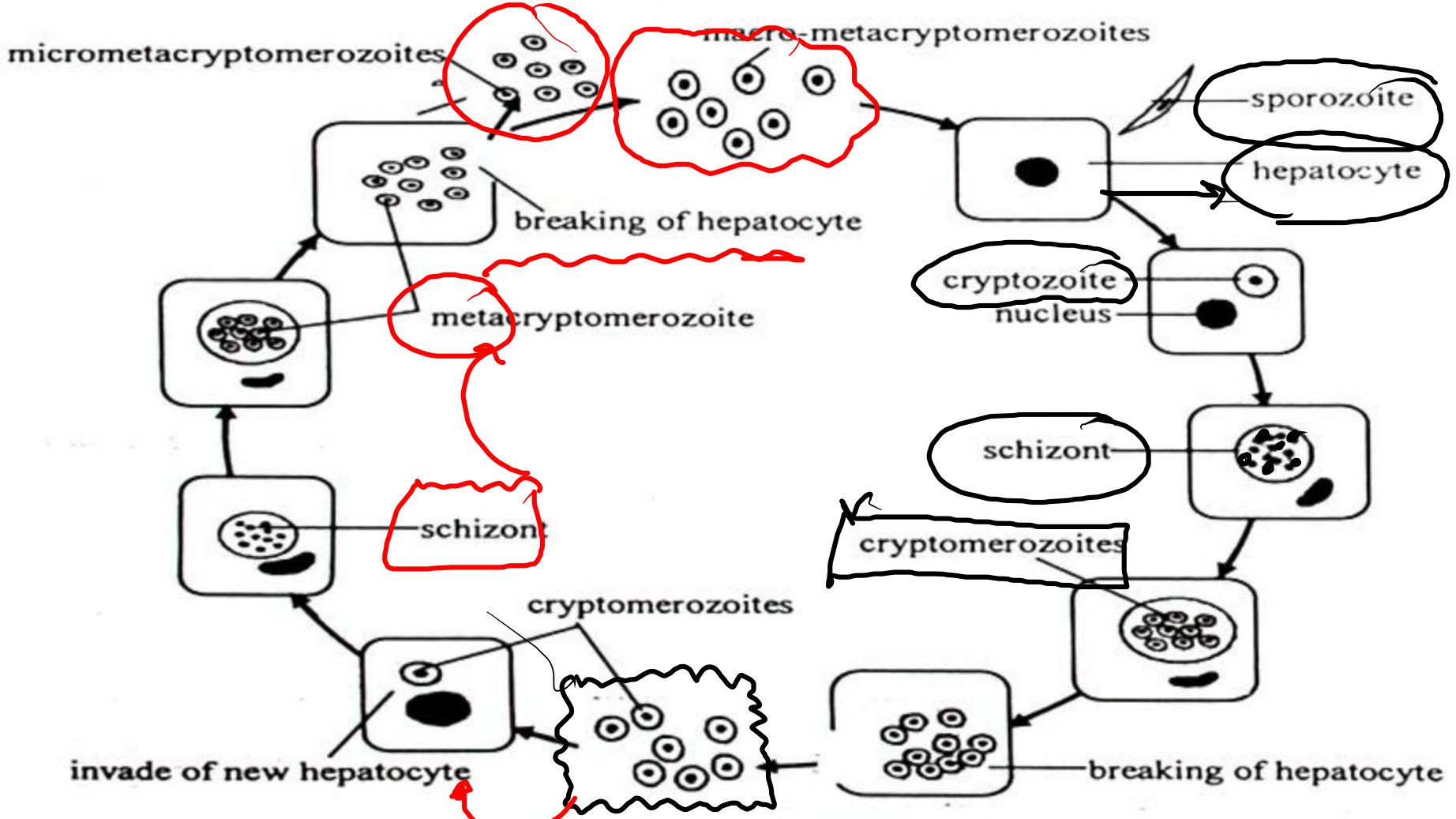


Fig 4.15 Hepatic schizogony of *P. vivax*

Erythrocytic schizogony

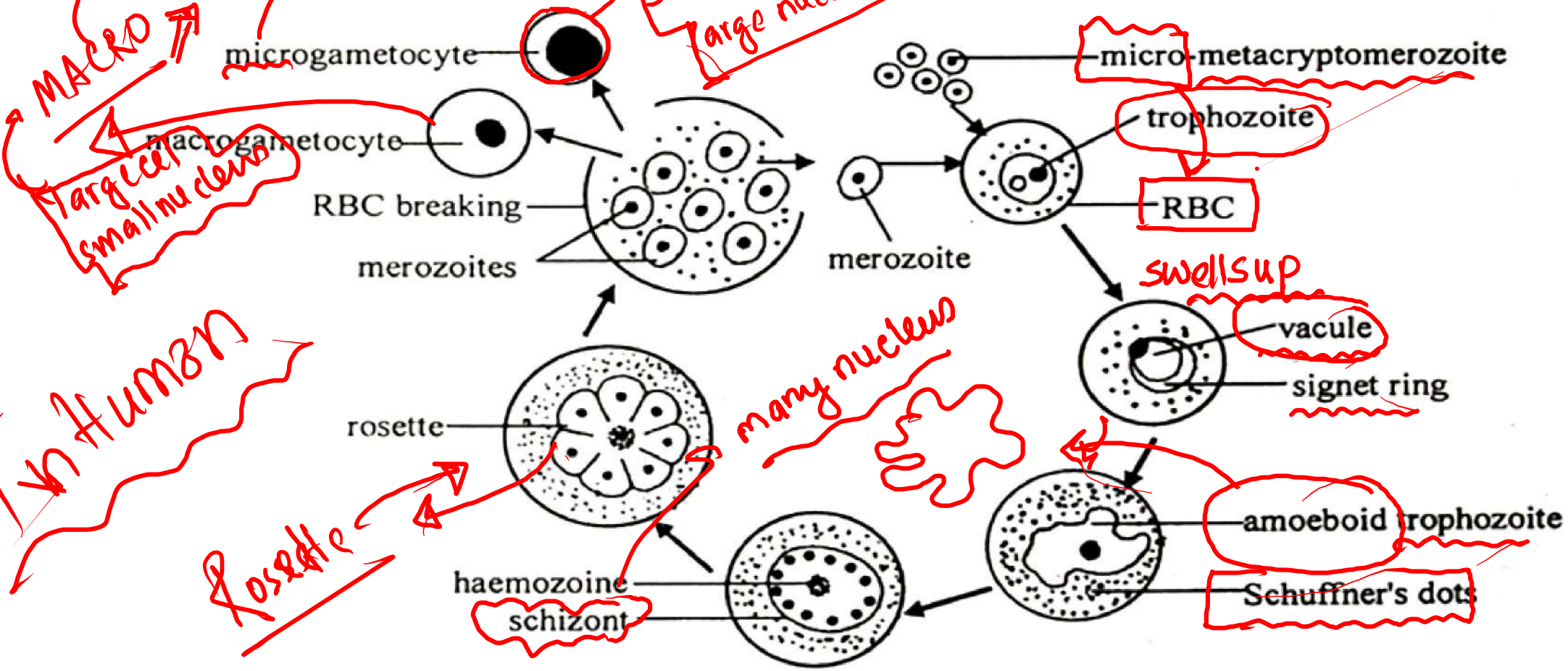


Fig 4.16 Erythrocytic schizogony of *P. vivax*

Sexual reproductive cycle of parasite in mosquito

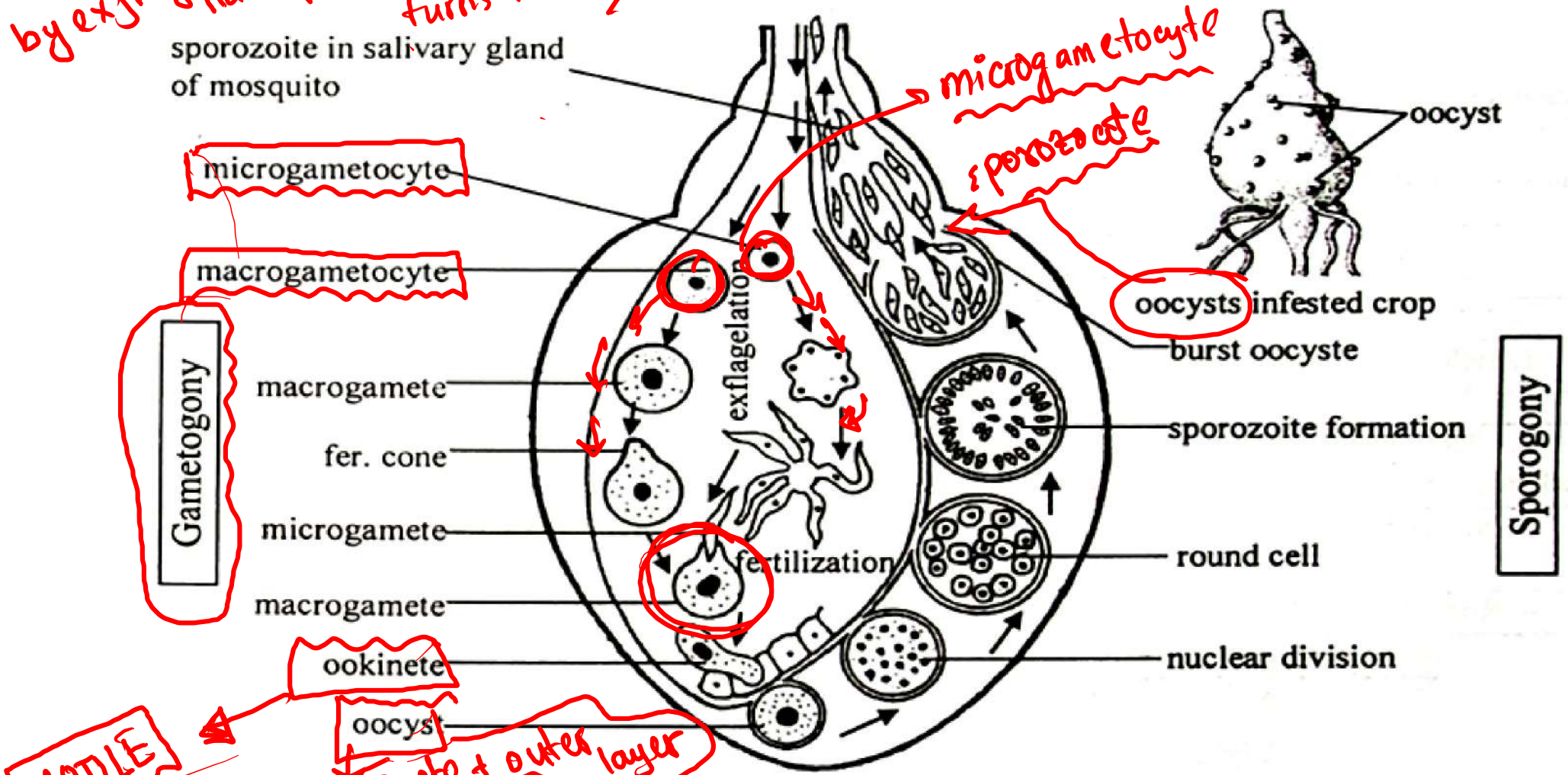


Fig 4.17 Sexual cycle of *P. vivax* in mosquito body

Life cycle of P. vivax

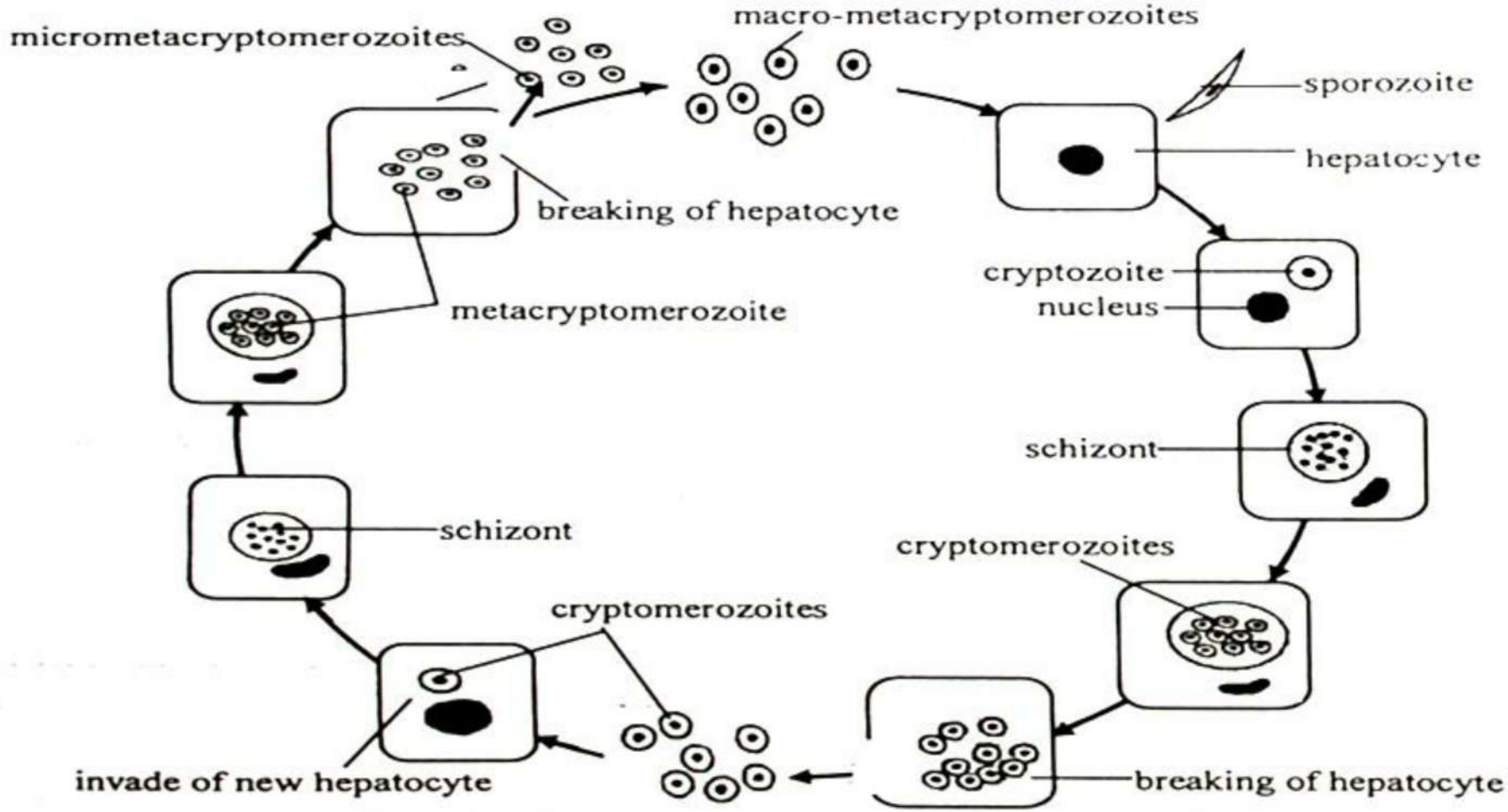


Fig 4.15 Hepatic schizogony of *P. vivax*

Hepatic or liver schizogony:

- 8,000-20,000 merozoites are formed from each schizont in pre-erithrocytic schizogonoy

- Takes about 7-10 days.

Erythrocytic Schizogony:

- Trophozoite
- Signet ring
- Amoeboid trophozoite: Malaria is diagnosed by the presence of Schuffners dots in RBC.
- Schizont (hemozoin)
- Merozoite: Rosette phase can be seen.
- Gametocyte: 2 types: a) Micor/male; b) Macro/female

Difference between Exo-erythrocytic (hepatic) and Erythrocytic Schizogony:

Criteria	Hepatic schizogony	Erythocytic schizogony
1. Where occurs	• In human liver	• In human erythrocyte.
2. Intermediate steps	• Steps include cryptozoite, cryptomerozoite and metacryptomerozoite.	• Steps include trophozoite, signet ring, schizont and merozoite.
3. Hemozoin	• Is not produced.	• Formed at the end.
4. Host reaction	• Patient does not encounter fever in this phase.	• Patient encounters fever with chills during this cycle.
5. Schuffner's dots	• Cannot be seen.	• Can be seen outside schizont.
6. Fever	• No fever.	• Fever with chills.

Malaria Vaccine:

- First vaccine of malaria in the world is called Mosquirix, which is also known as RTS,S.
- Doses- 4 which is able to produce active antibody against *P. falciparum*.

Poll Question: 06

During which schizogzony is malarial fever seen-

(a) Pre-erythrocytic
(b) Exo-erythrocytic
(c) Hepatic
(d) Erythrocytic

Poll Question: 07

Malignant tertian malarial fever occurs after every-

(a) 48 – 56 hours
(b) 72 – 100 hours
(c) 36 – 48 hours
(d) 24 – 48 hours

লেগে থাকো সৎ ভাবে,
স্বপ্ন জয় তোমারই হবে।