# 2.3. VIRUSES

#### SYNOPSIS

- Acellular, ultra microscopic entities with either DNA (or) RNA in a protein coat are **Viruses.**
- Microscopic organism that exhibit non-living characters like not responding to stimulus, no growth, no metabolism are **Viruses.**
- Like living organisms, viruses are able to maintain genetic continuity and undergo mutations
- Study of viruses is known as Virology.

#### History

- Louis Pasteur disproved -spontaneous generation.
- Germ theory of disease was proposed by Louis Pasteur.
- Andrew Lwoff Former director of pasteur Research Institute.
- Andrew Lwoff said "A Virus is a Virus".
- Loius Pasteur called, the disease agent for rabies as "virus".
- Edward Jenner, developed vaccine for small pox.
- Louis pasteur developed vaccine for rabies
- Iwanowski discovered Virus.
- He demonstrated that the agents responsible for causing TMV were **filterable agents**.
- **Beijerinck** described distinct nature of virus, who deiscribed them as **Contagium vivum fluidum** (Living infectious fluid).
- W.M Stanley crystallised tobacco mosaic virus
- N.W Pierie and F.C Bawden demonstrated that viruses are nucleoproteins.
- Gierrer and schramm proved nucleic acid as infectious agent and genetic material.
- Fraenkel Conrat confirmed genetic material of TMV is RNA
- Many viruses were reported utilising the techniques - Ultracentrifugation, X-ray crystallography and electron microscopy

#### **Types of Viruses**

- Obligate intracellular parasites are Viruses
- Viruses cannot survive without host.
- Depending on host virus specificity viruses are:
- Phytophages Zoophages

Zymophages

Cyanophages

- Virus that attacks plants
- Virus that attacks animals
- Bacteriophages Virus that infect bacteria
- Mycophages
  - Virus that infect Yeast cells
    - Virus that infect blue green algae

- Virus that attack fungi

#### Structure of viruses

- Viruses particles are called Virions
- Virus range in size from 10 to 300nm
- smallest virus is **Bacteriophage**  $f_2$
- Largest virus is Vaccinia virus, equal to size of smallest bacteria.
- Largest virus can be seen under Compound microscope

#### • Virus exhibit the following shapes

-	TMV
-	Vaccinia virus
-	Adeno virus
-	Polio virus
-	Bacteriophages
-	Rhabdo virus
	- - - -

- Virus exhibits two types of basic symmetries that depends upon the mode of arrangement of capsomers.
- In Helical symmetry capsomers are arranged in helical manner around the core of nucleic acid Eg: TMV
- In Cubic symmetry capsid is polyhedral and capsomers arranged in icosahedron Eg: Adeno virus
- T-even bacteriophages exhibit 'binal symmetry'
- Head is icosahedral, but tail is helical
- Chemical nature of Virion is -Nucleic acid and protein.
- Protein coat is called Capsid.
- Subunits of capsid are Capsomers

#### **Chemical structure**

- Functions of capsid protects the genetic material & aids in its transfer into host cells
- Membrane covering the capsid in animal virus is **Peplos.**
- Sub units of peplos membrane are Peplomers.
- Chemical composition of peplomers are Lipids, Proteins and Carbohydrates
- Plant viruses generally contain RNA (exceptions Cauliflower mosaic virus, Dahlia mosaic virus)
- Animal viruses generally contain DNA (exception Influenza & polio virus)
- Nucleic acids are either Circular (or) linear
- Viruses with single stranded DNA are -Bacteriophage - φx174, M<sub>13</sub> bacteriophage

#### UNIT - II :: VIRUSES

	<b>RNA</b> are - Wound	•	The head measures appoximately - 65 X 95 nm.		
	tumour virus, Reo virus, Rice dwarf virus, Blue	•	Shape of the head is - Hexagonal		
	tongue virus, Bacteriophage - $\phi$ 6	•	Head is covered by a single protein (molecule)		
•	Viruses containing only nucleic acid without protein		sheath which consists of several capsomers		
	coat are called - Viroids (eg. Potato spindle tuber	•	The molecular weight of capsid is - 80,000 daltons		
•	Infectious agents which possess only proteins, but not nucleic acids are called - <b>Prions</b> (eg., Scrapie	•	The head encloses - <b>double stranded DNA</b> head protein forms is a semipermeable membrane		
	disease of sheep, Mad cow disease of cow)	•	DNA is - 1000 times longer than phage.		
	3) Coliphage - $\lambda$ 4) T <sub>4</sub> - bacteriophage	•	The length of fail is - $95\mu$ and diameter is $8\mu$ .		
	Structure of Tobacco Mosaic virus (TMV)	•	The tail sheath is composed of - 200 sub units arranged helically or circularly		
•	TMV represents - Typical plant virus	•	In between head and tail. A small collar is present		
•	TMV was the first virus to be crystallised by -	•	The function of collar is not known		
•	Fraenklin et al described the structure of - TMV.	•	At the tip of tail, tail plate is present, which is -		
Vir	al diseases	•	From the tail plate - six tail fibres and six snikes		
	Viruses are <b>Obligate parasites</b> . Viruses cause a	•	originate.		
	number of plant, animal and human diseases. Most	•	The tail fibres are - specific attachement organs.		
	of the vital diseases are systemic.	Replication of Virus			
Str	ucture of TMV	•	The process of multiplication of viruses is referred		
•	Detailed structure was studied by using - X-ray	•	as - replication Replication of viruses was studied in great detail in		
•	TMV is a - rod shaped belical virus	•	bacteriophages		
•	Length of TMV is $-300$ nm and diameter is about	•	Two kinds of replication cycle occur in the phages		
•	<b>18</b> (or) <b>19</b> nm		1) lytic cycle		
•	Molecular weight is - $39 \times 10^6$ daltons		2) Lysogenic cycle		
•	Capsid made up of - Capsomers.		lytic cycle:		
•	Capsomers arrangement is in - Helical manner.	•	All T - even phages exhibit lytic cycle.		
•	Central core with nucleic acid <b>ss-RNA</b> diameter is - <b>4nm.</b>	•	Virus particles multiply inside the bacterial cell (host). These phages are virulent phages.		
•	Each capsomer is made up of a - Single	•	Multiplication of virulent phages is - Lytic cycle.		
	polypeptide chain with - 158 aminoacids.	Lys	sogenic cycle		
•	Apart from spirally coiled capsomers, ss-RNA is also spirally coiled to form helix	•	All Lambda series bacteriophages show Lysogenic cycle.		
•	TMV RNA consists of - 6,500 nucleotides.	•	Rarely the prophage can deintegrate and enter		
Str	ucture of Bacteriophage		into lytic cycle.		
•	Viruses which attack bacteria are - bacteriophages	•	When coliphage( $\lambda$ ) is compared with T. even		
•	Discovered by <b>Twort</b> and term coined by - Felix d'Herelle	•	phages Missing part is Tail sheath. The viral genome (after entry) gets integrated with		
•	Bacteriophage resemble a - Tadpole.		bacterial genome and is called <b>prophage.</b>		
•	Among tadpole shaped viruses structure <b>T-Even</b> <b>Phages</b> ( $T_2T_4$ amd $T_6$ ) have been well elucidated	•	Those able to become prophages are - <b>Temperate phages</b>		
•	Tadpole shaped phage consists of two parts - Head and the tail	•	replication of temperate phages is - Lysogenic cycle.		

• T even Bacteriophages have been studied in detail with reference to viral multiplication  $(T_2, T_4, T_6)$ 

#### The replication can be studied under following phases

- Adsorption
   Latent period
- 2) Penetration
  - 4) Lysis

#### Adsorption

- Attachment of viral particle of the host bacterium is called adsorption.
- Collision between the virions and bacterial cell and subsequent attachment to the surface of host by tail fibres.

#### Penetration

- Injection of phage nucleic acid into host cell is known as penetration.
- After the tail plate is fixed to the host cell, the tail sheath protein contracts.
- Lysozyme present in the tail may also help DNA penetration by producing opening in the bacterial cell wall.
- The empty head and tail of the phage remaining outside is called as  **ghost**.

#### Latent period

- This can be divided into two periods.
- The first half of the latent period is called **eclipse** because undetectable phages occur inside the cell.
- Duration between injection of viral DNA and the formation of complete phage is 'Eclipse'.
- The second half of the latent period is called as maturation period.
- Protein coats are synthesized first and nucleic acid later.
- Different components namely head, tail plate and tail fibres are synthesized separately.
- The process of assembling of the parts of virus into a new virion is called **maturation**.

#### Lysis

- After latent period host cell wall ruptures and virions get released, known as 'Lysis'.
- The cause of lysis is assumed to be due to the presence of  **Lysozyme.**
- The average number of virions is specific for a hostvirion system and is referred to as **burst size**.

#### Lysogenic life cycle

• Phage infects susceptible cells without causing immediate - Lysis.

- The viral genome becomes an intimate part of the bacterial cell.
- Close relationship exists for prolonged periods even when the cell undergoes many division cycles.
- The phage that undergoes this type of interaction are called **Temperate phages.**

#### Plant diseases

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#### 1. Mosaic

Colour change that occurs in isolated patches in the green lamina Eg. **Tobacco mosaic disease.** 

#### 2. Chlorosis

It is whitening or yellowing of the entire leaf due to the loss of chlorophyll.

#### Eg. Peach yellowing disease

#### 3. Vein clearing

Veins and veinlets become yellow while the lamina remains normal.

#### Eg. Bhendi vein clearing

#### 4. Vein banding

Tissues close to the vein remain green and remaining areas of lamina undergo chlorosis.

#### Eg. Citrus vein banding.

#### 5. Ringspots

Loss of chlorophyll in circular spots. Eg. **Tomato** spotted wilt, cherry ring spot

#### 6. Dwarfing or stunting

Reduced growth of plant parts Eg. **Rice stunting** 

#### 7. Malformation

Abnormal growth of plant or plant parts Eg. Swollen shoot of Cocoa

#### 8. Colour Breaking of flowers

Loss of colour in petals at certain parts and formation of dark colours at other parts.

#### Eg. Tulip mosaic break

A viral infected Tulip flowers are sold at a higher price than the heatlhy flowers.

#### **Transmission of Viral diseases**

- Viruses are transmitted from one plant to another plant in a number of ways.
- Viral diseases transmission vary according to the virus and the host.
- Very few viruses are transmitted by air, water and by contact.

# The chief methods of transmission of plant viruses are:

#### Vegetative parts

- The concerned viruses are transmitted by buds, stem cuttings bulbs and rhizome.
- Some are transmitted by grafting method. This method of transmission is chiefly seen into Potato, Banana, Sugarcane, Rose.

#### **Mechanical transmission**

- Some viruses are transmitted through the sap of the infected plants. Eg. **Potato virus.**
- It takes place through physical contact, agricultural implements and hands of labour.

#### Seed transmission

More than fifty percent of viruses are reported to be transmitted through seeds.

#### Eg. Bean mosaic, Lettuce mosaic

#### **Pollen grains**

Pollen grains produced from virus infected plants usually possess virus. Such pollen transmit the viruses to pollinated plants. Eg. **Cherry ring spot disease.** 

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#### Insects

Undoubtedly the most common method of transmission of viruses is by the activity of insects, which are termed as vectors such as Thrips, Mosquitoes, Aphids.

Ex: Rice tungro, Potato leaf roll, Papaya mosaic etc

#### Nematodes

Genera **Xiphenema** and **Longidorus** are known to be involved in the transmission of soil borne virus diseases.

#### Fungal transmission

Certain fungi take part in the transmission of viruses for Eg. the root infecting fungus **Olpidium brassicae** transmits, Tobacco necrosis virus through its Zoospores.

#### **Phanerogamic parasites**

Among angiospermic plant parasites, **Cuscuta** was proved to transmit the virus through its haustoria.

#### **Control of Viral diseases**

The following general methods can be adapted to control the viral diseases

#### Exclusion of the source of infection

- This method prevents the entry of the source of infection into an area where it is not naturally existing.
- Quarantine laws restricts the entry of infection.
- The prophylactic measure is used to prevent the entry of new diseases, insets and weeds from other countries is quarantine.

#### Isolation of the source of infection

- Common practice is to isolate and eradicate completely the diseased hosts.
- If any infected plant is detected it should be destroyed by roguing and burning, weeds which serve as hosts similarly eradicated.

#### **Eradication of vector**

- Vector control is considered as an important strategy in preventing viral diseases.
- By using suitable insecticides insect vectors can be destroyed

#### Chemotherapy

- Chemicals having viral inhibiting properties are -Cytovirin-2, Thiouracil, 2,4-D, Zinc sulphate and malachite green.
- Zinc sulphate and malachite green can be used to control the diseases.

#### Breeding of disease resistant varieties

- Breeding and cultivation of resistant varieties seems to be the most effective method.
- In this the host system becomes immune to the virus infection.

#### VIRUSES INTRODUCTION

#### LEVEL - I

99. Yellow fever is caused by

1) bacteria	2) fungi
3) viruses	4) allergic reactions

#### LEVEL - II

100. Viruses do not show	
I) Mutation	II) Motility
III) Metabolism	
1) I & II are correct	2) II and III are correct
3) II alone is correct	4) III alone is correct

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104. W to 1) 3) 105. W 1) 3) 106. W ge 1) 3) 107.	/ho estab bacco m Stanley Beijerir /hat doe Pathog Poison /ho dis neration Louis P Edward List -I 1. Loui IIBeij	olished t nosaic di nck s the ter en proved n'? Pasteur d Jenner is pasteu erinck	hat the f isease v m 'virus the th	<ul> <li>4) Stat</li> <li>ilterable vas diffus</li> <li>2) Iwar</li> <li>4) Past</li> <li>s' mean?</li> <li>2) Dise</li> <li>4) Deat</li> <li>neory of</li> <li>2) Rob</li> <li>4) And</li> <li>List-II</li> <li>A) Filt</li> <li>B) Cry</li> <li>ure</li> <li>C) Livi</li> <li>fluid</li> </ul>	infective agent of sble like a liquid nowski eur case th f 'Spontaneous ert Koch re Lwoff I terable agents stallization of ase ing infectious d	LEVEL - 109. Viru I) Pa II) E III) ( 1) B 2) B 3) II LEVEL - 110. Iden I. Cy II. H III) N IV) Y	TY - I sees are urtial para axtracellul Obligate i oth I & II oth I & II oth III & I alone is - II tiy the co /anophag lost - Viru Mycopha	PES OF sites ar parasit ntracellul are corr I are corr correct rrect state es infect o s associa ges infect ust be vie	VIRUS es ar parasit ect rect 4) I a ements. cyanobac tion is sp autotrop	ES res llone is co eteria ecific. hic thallo h the scant	orrect ophytes. ning and
104. W to 1) 3) 105. W 1) 3) 106. W ge 1) 3) 107.	<ul> <li>Koen</li> <li>Koen</li> <li>Koen</li> <li>Yho estab</li> <li>bacco m</li> <li>Stanley</li> <li>Beijerin</li> <li>Pathoge</li> <li>Poison</li> <li>Poison</li> <li>Poison</li> <li>Couis P</li> <li>Edward</li> <li>Louis F</li> <li>Edward</li> <li>List -I</li> <li>1. Loui</li> <li>II.Beij</li> <li>III.Iwat</li> <li>IV.W.N</li> </ul>	olished t nosaic di nck s the ter en proved n'? Pasteur d Jenner is pasteu erinck nowski	hat the f isease v m 'viru: the th the th	<ul> <li>4) Stati</li> <li>2) Iwar</li> <li>4) Past</li> <li>5' mean?</li> <li>2) Dise</li> <li>4) Deat</li> <li>10 Deat</li> <li>10 Deat</li> <li>10 Deat</li> <li>11 Deat</li> <li>12) Rob</li> <li>4) And:</li> <li>11 List-II</li> <li>A) Filt</li> <li>B) Cry</li> <li>ure</li> <li>C) Livit</li> <li>fluid</li> <li>D) Vac</li> </ul>	infective agent of sble like a liquid nowski eur ease th f 'Spontaneous ert Koch re Lwoff I terable agents stallization of ase ing infectious d ccine for Rabies	LEVEL - 109. Viru I) Pa II) E III) ( 1) B 2) B 3) II LEVEL - 110. Iden I. Cy II. H III) N IV) V trasr	TY - I sess are artial para axtracellul Obligate i oth I & II oth I & II oth III & I alone is - II tity the co /anophag lost - Viru Mycopha, Viruses m nission el	PES OF sites ar parasit ntracellul are corr I are corr I are corr correct rrect state es infect of s associa ges infect ust be vie ectron mi	VIRUS es ar parasit ect rect 4) I a ements. cyanobac tion is sp autotrop ewed with croscope	ES es llone is co eteria ecific. hic thallo h the scannes.	orrect ophytes. ning and
104. W to 1) 3) 105. W 1) 3) 106. W ge 1) 3) 107.	A control of the stab bacco main of the stab bacco main of the stab bacco main of the stab Beijerin /hat does Pathog Poison /ho dis Poison /ho dis meration Louis P Edward List - I 1. Loui IIBeij III.Iwan IV.W.M	olished t nosaic di nck s the ter en proved n'? Pasteur d Jenner is pasteu erinck nowski A. Stanl	hat the f isease v m 'viru: the th the th	<ul> <li>4) Stati</li> <li>2) Iwar</li> <li>4) Past</li> <li>2) Dise</li> <li>4) Deat</li> <li>10 Deat</li> <li>10 Deat</li> <li>10 Deat</li> <li>10 Deat</li> <li>10 Deat</li> <li>11 Deat</li> <li>12) Rob</li> <li>4) And:</li> <li>11 List-II</li> <li>A) Filt</li> <li>B) Cry</li> <li>ure</li> <li>C) Livit</li> <li>fluit</li> <li>D) Vac</li> <li>E) Cry</li> </ul>	infective agent of sble like a liquid nowski eur ease th f 'Spontaneous ert Koch re Lwoff I terable agents stallization of ase ing infectious d eccine for Rabies ystallization of	LEVEL - 109. Viru I) Pa II) E III) ( 1) B 2) B 3) II LEVEL - 110. Iden I. Cy II. H III) N IV) V trasr 1) I,	TY - I sess are artial para xtracellul Obligate i oth I & II oth I & II oth III & I alone is - II tiy the co vanophag lost - Viru Mycopha, Viruses m nission el II & III	PES OF sites ar parasit ntracellul are corr I are corr I are corr correct rrect state es infect of s associa ges infect ust be vie ectron mi	VIRUS es ar parasit ect rect 4) I a ements. cyanobac tion is sp autotrop ewed with croscope 2) II	ES es llone is co eteria ecific. hic thallo h the scannes. & III	orrect ophytes. ning and

#### STRUCTURE OF VIRUSES

#### LEVEL-I

111. Assertion(A): Symmetry of virus depends upon the mode of arrangement of capsomers

Reason (R): In TMV, RNA is coiled helically in the capsid.

112. Coliphage -  $\lambda$  differs from T-even bacteriophage in

1) not having nuclei acid

2) not having contractile sheath

3) having contractile sheath

4) not having head capsid

#### LEVEL - II

113. Study the following table

Virus	Shape	Symmetry		
I) Adenovirus	Polyhedral	Helical		
II) Vaccinia	Bullet	Cubic		
III) TMV	Rod	Helical		
IV) $T_2$ bacteriophage	Tadpole	Binal		
Which two taxa shows the correct combination				
1) I & III	2) II &	z IIII		
3) III & IV	4) II &	z IV		
SIZE				

#### LEVEL-I

114. The largest virus is

1) Vaccinia virus	2) Influenza virus
3)TMV	4) Bacteriophage f2

#### LEVEL - II

115. Identify the following in the **correct** descending order based on the size.

I) TMV	II) Bacteriophage f,		
III) Vaccinia virus			
1) III,II,I	2) I,II,III		
3) III,I,II	4) II,I,III		
SHAPE			

#### LEVEL - I

116. Assertion(A): TMV is a rod shaped virus Reason (R): TMV shows helical symmetry

#### LEVEL - II

117. Identify the correct statement from the following1) Both animal and plant Rhabdo viruses are rod shaped.

2) Animal Rhabdo viruses are rod shaped while plant Rhabdo viruses are bullet shaped.

3) Both animal and plant Rhabdo viruses are bullet shaped.

4) Animal Rhabdo viruses are bullet shaped while plant Rhabdo viruses are rod shaped.

118.	Shape		Exam	ple	
	I. Rod shape		A) Rhabdo virus		
	II. Polyhedral		B) Poli	o virus	
	III.Spherical		C) Ade	no Virus	
	IV. Bullet		D) TM	V	
	The correct ma	atch is			
	Ι	Π	III	IV	
	1) B	А	D	С	
	2) D	С	А	В	
	3) C	D	В	А	
	4) D	С	В	А	
	CHEMIC	AL STF	RUCTU	RE	
LEV	EL-I				
119.	Assertion(A): Usu	ally plan	nt viruses	s contain RNA	
	Reason (R): RNA	act as a	genetic r	material in TMV	
120.	20. The genetic material in the viruses can be				
	1) DNA		2) RNA	A	
	3) DNA or RNA	4) DNA	A and RNA		
121.	21. Peplos is the outer part of the virus particle and is composed of			s particle and is	
	1) Amino acids and enzyme				
	2) Enzymes and P	roteins			
	3) Lipids, Carboh	ydrates a	and prot	eins	
	4) Carbohydrates	and Enz	ymes		
122.	Blue toungue virus	s contain	S		
	1) ds DNA 3) ds RNA		2) ss RNA 4) ss DNA		
123.	ss DNA is found in	n this ba	cterioph	age	
	1) φ <i>x</i> - <i>174</i>		2) φ <i>6</i>		
	$(3)f_2$		4) T-ev	en	
	L	EVEL -	II		
124.	Assertion(A): Vin	uses co	nsists of	both DNA and	

RNA Roscon (B): In viruses the constitution material is either

Reason (R): In viruses, the genetic material is either DNA or RNA

125. Chemie	cally viru	ses rese	mblethis	cell orga	nalle.	
1) Chlo	oroplast	2) Rib	osome			
3) Mito	chondric	on	4) Nu	cleus		
126. Virus	Ca	Co	re			
I.Prio	n pr	esent	Abs	ent		
II. Virio	n A	bsent	pres	sent		
III.Virc	oid A	bsent	pre	sent		
Identif	y the corr	rect con	nbination	()		
1) <b>I&amp;I</b>	Ι		2) II (	& III		
3) I &	II		4) I.I	4) I.II.& III		
127. <b>Ty</b>	Nucl	Nucleic Acid				
I. TMV	A) ss	DNA				
II. Bacteri	B) ss	RNA				
III.Bacteri	ophage -	ф×174	C) ds	C) ds RNA		
IV. $T_2$ - bac	teriopha	ige	D) ds	D) ds DNA		
The correct	match is	5				
	Ι	Π	III	IV		
1)	С	В	А	D		
2)	В	С	А	D		
3)	В	С	D	А		
4)	А	D	В	С		

#### VIROIDS

#### LEVEL-I

128 Viroids contain		
126. Virolus contain	II) Concomona	133. Who
III) Peplomers	II) Capsoliters	1) T
1) I alone is correct	2) II and IIi are correct	3) F
3) I & II are correct	4) all are corect	134. Whi

#### PRIONS

#### LEVEL-I

129. Assertion(A): Mad cow disease is caused by viroids Reason (R): Prions can cause disease even without having any nucleic acid.

#### **STRUCTURE OF TMV**

#### LEVEL-I

130. The number of capsomers present in the protein coat of TMV is

1)2130	2) 1510
3) 580	4) 200

### L

LEVE	L - 11			
131.	List - I			List - II
I.	Length of Th	A) 2130		
II.	Diameter of	fTMV		B) 300 nm
II	I.Molecular	weight of	TMV	C) 39 ×10 <sup>6</sup>
IV	V. Number of	Protome	rs in	D) 18 - 19 nm
	Capsid of	TMV		
Tl	he correct m	atch is		
	Ι	II	III	IV
1)	В	D	С	А
2)	D	В	С	А
3)	В	D	А	С
4)	А	В	С	D
132.	I. Both cap	somers a	nd core a	arranged helically.
	II. 2130 ca	psomers	are of ic	lentical size, each
	of which	contain	158 Am	ino acids.
	III.Core con	tain ds RN	VA with	6500 nucleootides.
	IV. Extensiv	ely studio	ed by ma	ny scientists
	Identify the to TMV	incorrect	t stateme	ent with rerence
	1) I & II		2) III	only
	3) II & IV		4) I 8	& III
S	TRUCTU	RE OF BA	ACTER	IOPHAGE

#### LEVEL-I

- o coined the term 'bacteriophage'?
  - wort 2) Andre Lwoff
  - elix d'Herelle 4) Louis Pasteur
- ich of the following is the contribution of Twort to virology?
  - 1) Coined the term 'virus'
  - 2) Coined the term 'bacteriophage'
  - 3) Discovered bacteriophage
  - 4) Proved chemical nature of bacteriophage
- 135. The number of sub-units in each of the ring of typical  $T_4$  bacteriophage tail sheath is
  - 1) 24 2) 6 3) 144 4) not constant

#### LEVEL - II

136. T-even bacteriophages show

I) Helical symmetry only	II) Cubic symmetry only
III) Tadpole shape	IV) Binal symmetry
1) I alone	2) I & IV only
3) II & IV only	4) III and IV

137. Identify the correct descending order of the different parts of a bacteriaphage starting from top to bottom.

I) Head Capsid	II) DNA Strand
III) Collar	IV) Tail fibres
1) I,III,IV,II	2) III,II,IV,I
3) I,II,III,IV	4) IV,II,I,III

138) Correct match related to  $N_{2^{-}}$  bases in T- even phages

I. 6 - amino pur	rine		A) Guanine
II.5 - hydroxy m	B)Adenine		
III.2- amino,-6-	oxypuri	ne	C) Thymine
IV. 2, 6 - Dioxy	D) Cytosine		
pyrimidine			
I	П	III	IV

	_			
1)	В	D	А	С
2)	D	В	А	С
3)	В	D	С	Α
4)	А	В	С	D

139. I. Structure of T - even phages have been well elucidated.

> II. In cross secton head is hexagonal measures  $65 \times 95 \mu$

III. Head encloses, several folded dsDNA.

IV. In T - even phages both Adenine

and guanine lack methyl group Identify correct statement related to T<sub>4</sub> -

bacteriophage 1) L II & III  $\rightarrow$  II III IV

1) I, II & III	2) II, III IN
3) I,II, III & IV	4) II only

I. In T - even phages number of pins are equal 140. to number of tail fibres.

> II. Each tail fibre has two parts proximal and distal half fibre.

III. The tail fibres help in recognition of specific receptor sites on host cell wall.

IV. The tail fibres are specific attachment organs.

1) II & III are only correct.

- 2) All are correct
- 3) III &IV are only correct
- 4) IV only correct.

#### LYTIC CYCLE

#### LEVEL-I

141. The multiplication process of virulent phages is called 1) Transduction 2) Lysogenic cycle 3) Transformation 4) Lytic cycle

LEV	/EL-11	
142.	Assertion(A): Virulent pha	ges exhibit lytic cycle.
	Reason (R): The average	number of virions is spe-
	cific for a host virion system	m.
	1. A and R are correct, R is	the correct explanation
	ofA	
	2. A and R are correct but ]	R is not correct explana-
	tion of A	
	3. A is false but R is true.	4. A is true but R is false.
143.	Find out the correct sequer	ce of events of lytic cycle
	of a phage	
	I) Penetration	II) Latent period
	III) Lysis	IV)Adsorption
	1) IV.III.II.I	2) III,II,I V,I
	3) 1,1V,11,111	4) 1V,1,11,111
144.	Eclipse stage refers to	XTA • / 1 1 / •
	1) The release of phage D	NA into the bacterium
	2) Attachment of virion to	the bacterial wall
	3) The non appearance o	f any phages inside the
	bacterium	
	4) The rupture of host cell	
145.	During viral lytic cycle, 'gh	ost'represents
	1) viral nuclei acid 2) virie	on 3) empty capsid
	4) viral DNA intigrated lin	k host DNA
146.	'Burst size' refers to	
	1) The number of host cell	ls attacked by a virion
	2) The number of virions	required to attack a host
	cell	
	3)The number of new virio	ns released per each host
	cell	
	4)The maximum size of the	he host cell attacked by a
	virion	
147.	Assertion (A): The first h	half of the latent period
	iscalled the eclipse.	
	Reason (R) : Synthesis	of new phages occur in
	maturation period.	
148.	Assertion (A): During ma	turation period usually
	capsid protein are synth	nesized later and core
	components are synthesize	ed first.
	Reason (R): During secon	d phase of latent period,
	synthesized. viral compo	nents are assembled to
1 4 0	produce complete virions.	1 0
149.	I. Burst Size refers to th	he average number of
	virions is specific for h	iost - Virson system.

II. During elicipse period, the virions were identified but are concealed.

Π	I.During ly	tic and ly	ysogenie	c cycle soon after	,	TRANS	MISSI	ON OF	VIRUS	5 DISEAS	SES
phage DNA injection, thehost DNA degrades.					LEV	/EL-I					
IV) During maturation period, viral compo nents are assembled.					154.	154. Assertion(A): Potato leaf roll disease is transmitted through insects				nsmitted	
1	) I, II & IV	are cor	rect.			Reason	(R): Pol	lengrair	ns are inv	volved in t	he trans-
2	) I,.II & IV	are inco	rrect			mission	of rice ti	ungro di	sease.		
3	) III & IV a	ire incori	rect		155.	Cherry r	ing spot	disease	spreads	through	
4	) $1 \& IV$ ar	e correct	ţ			I) Mosqu	uitoes		II) Po	ollen grains	5
	T	VSOCE		VCLE		III)Aphi	ids		IV) S	Seeds	
LEVEL	.T	15001		ICLE		1) II alor	ne is cor	rrect	2) II a	& III are c	orrect
	-I rtion(A)·Co	linhaga	omies	outhrogenic arele		3) I & IV	V are co	rrect	4) III	& IV are	correct
130. Asso	(R). Tem	nerate nh	A cames	bit hysogenic cycle	156.	Potato le	eaf-roll o	disease	is cause	d by	
PLAN	NT DISEA	SES CA	USED	RV VIRUSES		1) Myco	plasma		2) Vi	rus	
IEVEI	II DISEA	SES CA	USED	DI VIRUSES		3) Micro	ospores		4) Ba	cterium	
151. Whi	- 11 ch of the fol	lowing vi	ral disea	ses in plants is com	_ 157.	Tobacc	o necro	osis vii	rus is t	ransmitte	ed by a
merc	cially exploi	ited?				1) $Olph$	idium h	vassioa	$(2) V_{i}$	nhinama	
1) Sv	wollen sho	otofcoc	oa			$\frac{1}{2} Oipni3) Long$	idorus	rassicae	2 2) Л	рппета	
2) To	omato spot	ted wilt				(A) Phyte	anhthor	a infact	anc		
3) Ti	ulip mosaic	break	4) Ri	ce tungro	159	Nomata	do invo	u <i>injesi</i> Ivod in i	uns tronomi	acion of a	magail
152. L	IST -I			LIST - II	136.	borne vi	ral disea	ises is/ai	re	551011 01 50	onie son
I.	Cherry rin	g spot		A) Fungi		1) <i>Olph</i>	idium		2) Xi	nhinema	
II	. Lettuce m	nosaic		B) Pollen		3) Long	idorus		4) Be	oth 2 & 3	
Π	I.Rice tung	ŗo		C) seed	LEV	EL-II			,		
Г	V. Tobacco	necrosis	5	D) Insects	159.	Assertio	n(A): Ve	ein clear	ing is a v	viral diseas	se
Т	he correct	match is			R	eason (I	$(\mathbf{R})$ . It is t	the loss	of chlor	rophyll in	the leaf
	Ι	Π	III	IV	1	lamina e	xcept th	e midrib	and late	eral veins	une reur
1)	В	С	А	D	160.	Soil bor	ne viral o	diseases	spread	through	
2)	С	В	D	А		I) Seeds			II) Ins	sects	
3)	В	С	D	А		III) Xinl	henema		IV)	) Unhidium	,
4)	A	В	С	D		1) I & II	are cor	rect	2) III	& IV are	correct
153. L	list - I			List - II		3) II & I	V are co	orrect	4) III	& IV are c	orrect
I. Yello	wing of the	e entire le	eat A)	Ring spots	161.	List -	- I		,	List - I	Ι
II. Colo	our change	s in patel	nes B)	Malformation	A)P	otato vir	us	I) St	oread th	rough poll	en
III L os	ne lonage	nhullin	C	Thlorosis	B) C	herry rin	g spot	II) S	pread th	rough veg	etative
III.LOS	ircular spot	s puòn m	CA	211010515				pa	arts		
IV. Abı	normal gro	s wth of	D)	Mosaic	C) T	'NV		III) S	preads l	oy Mechai	nical
D.	lant parts	will of	2)		פות	anava m	osaic		nsmissi bread th	on rough fun	ai
T	'he correct	match is				apayam	USale	V S	pread th	rough vec	tors
	Ι	Π	III	IV		The corr	ect mate	ch is	91 <b>0000</b> 011		
1)	А	В	D	С			Α	В	С	D	
2)	D	С	А	В		1)	Ι	II	V	III	
3)	С	D	А	В		2)	IV	III	Π	Ι	
4)	D	С	В	А		3)	III	I	IV T	V	
						4)	V	IV	Ш	111	

UNIT - II :: VIRUSES

CONTROL OF VIRAL DISEASES				168. The ratio of ribonucleotides to capsomers in TMV particle is						
LEVEL - I					1) 2 : 1	2) 3 :	1	3) 1 : 2 4) 1 : 3	3	
162. Which of the following is not a viral inhibiting chemi- cal?				169. Number of aminoacids in each capsomere, number				umber otides		
1) Maelac	hite gr	een	2	) Thiouracil		in the nuc	leic aci	d in TMV	respectively are	Judes
3) 5-hydr	oxy me	ethyl cyto	cine 4	4) $ZnSO_4$		1) 158, 2	130, 65	500	2) 2130, 6500, 1	58
LEVEL - II						3) 6500,	2130, 1	158	4) 6500, 158, 21	30
163. Assertion viral disea	(A): M ises	alachite g	green is u	used in control of	170 The ratio between the number of capsomers, the number of rings of capsomeres and the number of				s, the ber of	
Reason ( properties	R): It is s	s found to	) posses	s viral inhibiting		capsome bactrioph	res in age is	each ring	g in the tail shea	th of
164. I(Chara	acter)			II(Method)		1)24:4	: 1		2) 1 : 4 : 24	
I. Enforce	ment o	f	A) Ch	emotherapy		3) 6 : 1 : 2	24		4) 4 : 24 : 1	
Quarar	ntine lav	WS			171	During ly	tic cyclo	e, viral pro	oteins are synthesiz	ed
II. Insectic	ides		B) Exc	clusion of the		1) On bac	terial rib	osomes us	ing amino acids of v	iruses
			sour	rce of Infection		2) On vira	al ribson	mes using	amino acids of ba	cteria
III.Roguing	and b	urning	C) Era	dication of		3) On vira	al riboso	omes usin	g the m-RNA of vi	ruses
88	9		vec	tors	1.70	4) On bac	terial rib	osomes us	ing amino acids of ba	icteria
IV. Malac	hite gro	een	D) Iso	lation of the	172. Regarding lysogenic cycle					
	U		source	of infection	I) Exhibited by colliphage $\lambda$					
The co	rrect n	natch is			II) Vegetative phages becomes the prophage					
	Ι	П	III	IV		released i	pnages	s iormea ately	in the nost cell af	e not
1)	В	С	А	D		IV) Phage	$\rightarrow DNA$	is replica	ed during binary f	ission
2)	B	C	D	A		of host ce		isreplica		.551011
3)	С	В	D	А		1) I and I	I correc	ct	2) I, II, III correct	t
4)	Δ	B	C	D		3) II, III,	IV cori	rect	4) I, II, IV correc	t
165 Assertion	(A)·Ci	ultivation	ofrecist	D ant varieties seem	173.	. Study the	followi	ng lists		
to be mos	t effect	ive meth	od for vi	iral plant disease		List - I			List - II	
control				F		A) Most	of the p	lant	I) Bacteriophage	φ6
Reason (I	?)•In r	esistant	varieties	s the host system		viruses co	ontain R	NA		
becomes i	mmun	e to the vi	irus infe	ction.		except	a moath	usingle	II) Delie vinue	
	1		- 111			D) KINA I stranded	s mosu excent	y single	II) Pollo virus	
166 Shane	Sv	mmetry	Fva	mnle		C) Most of	of the ar	nimal	III) M - 13 phage	;
A) Pod	Бу Ца	licol	цла ТМ	V		viruses c	ontain I	DNA	/ 10	
A) Kuu $(D) T (1 - 1)$	D.	1		v 1		ecxept				
B) Tad-pole	Bli		1 <sub>4</sub> 08	acteriophage		D) DNA	is mostl	ly double	IV) TMV	
C) Polyhedr	al Cu	bıcal	Ade	no virus		stranded	except	In	V) Dahlia magaia	
D) Tad-pole	e Cubi	ical only	T <sub>2</sub> ba	cteriophage		The corre	ect mate	h is	v)Danna mosaic	virus
Identify th	ie incor	rect com	bination	l		Δ	R	C	D	
1) B & D	2) D	only 3	) A & C	4) A,B,&C		1) V	I	п		
167 TMV part	ticle ha	ving 710	capsom	ers would have a		2) V	I	П	III	
length of						2) V 3) IV	ı V	П Т	Ш	
1) 33 nm	2) 9	9 nm	3) 30 1	nm 4) 100 nm		5) IV 4) П	v V	T	TV	
						т) II	v	1	ŢŶ	

UNIT - II :: VIRUSES

<ul> <li>A) Adsorption phase</li> <li>I) Contraction of tail sheath</li> <li>B) Maturation phase</li> <li>II) Cell wall dissolution by the presence of lyozyme</li> <li>C) Penetration phase</li> <li>III) Auto catalysis followed by heterocatalysis</li> <li>D) Lytic phase</li> <li>IV) Collision between virion components</li> <li>Contraction of tail sheath</li> <li>Contraction phase</li> <li>Contraction of tail sheath</li> <li>Contraction phase</li> <li>Contraction phas</li></ul>
<ul> <li>sheath</li> <li>B) Maturation phase</li> <li>C) Penetration phase</li> <li>D) Lytic phase</li> <li>D) Lytic phase</li> <li>Sheath</li> <li>Reason (R): Viruses do not replicate outside the host but they remain alive.</li> <li>The correct answer is:</li> <li>178. Identify the correct pair that shows the double stranded RNA among the following (EAMCET - 2005)</li> <li>D) Lytic phase</li> <li>IV) Collision between virion components</li> </ul>
<ul> <li>B) Maturation phase</li> <li>B) Maturation phase</li> <li>B) Maturation phase</li> <li>C) Penetration phase</li> <li>D) Lytic phase</li></ul>
<ul> <li>by the presence of lyozyme</li> <li>C) Penetration phase</li> <li>D) Lytic phase</li> <li>D) Lytic phase</li> <li>Identify the correct pair that shows the double stranded RNA among the following (EAMCET - 2005)</li> <li>1) Cauliflower mosaic virus and Dahlia mosaic virus</li> </ul>
C) Penetration phase III) Auto catalysis followed by heterocatalysis D) Lytic phase IV) Collision between virion components
by heterocatalysis D) Lytic phase IV) Collision between virion components I) Cauliflower mosaic virus and Dahlia mosaic virus
D) Lytic phase IV) Collision between virion components
Virion components
2) Poliovirus and wound tumour virus
components 3) Wound tumour virus and Reovirus
The correct match is 4) Tobacco mosaic virus and Reovirus
A B C D 179. Study the following lists (EAMCET - 2007)
1) IV III II I List - I List - II
2) IV V I II (A) Epulopiscium fishelsoni I. Vector
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
4) II v I IV (C) Treponema pallidum III. Bacitracin
LEVEL-III (D)Agrobacterium IV. Bioinsecticide
175. An organism exclusively with 70 S type of ribo- tumefaciens V. Syphilis
somes contains one of the following The <b>correct</b> match is
(EAMCET - 2004) A B C D
1) DNA enclosed within a nuclear membrane 2) Circular naked DNA
2) Circulal haced DNA 3) Double stranded DNA with protein coat 2) III I II IV
4) Single stranded DNA with protein coat 3) V II I III
176. Study the following table :4)IVIIV
List IList II180.Which of the following are correct to describe
A) Devoid of flagella I. Single spherical
bacterium I. Simple and unicellular organisms.
B) Rod shaped II. Pneumonia causing II. Contain DNA or RNA and enclosed by protein coat.
C) Bacteria in pairs III Anthrax causing IV Maintain genetic continuity and respond to sumul.
bacteria bacteria The correct combination is
D) Coma shpaed IV. Cholera causing 1) L and IV.
bacteria 3) II and III 4) I and III
V. Pleomorphic bacteria 181. Study the following lists (EAMCET - 2008)
A B C D List - I List - II
1) I II III V A) M13 bacteriophage I. ds RNA
2) V IV II I B) Rice dwarf virus II. ss RNA
3) I III II IV C) Cauliflower mosaic virus III. ss DNA
4) V I II IV D) Pollio virus IV. ds DNA

The correct match is

	А	В	С	D
1)	III	Ι	IV	II
2)	II	Ι	III	IV
3)	III	IV	Π	Ι
4)	IV	III	Ι	II

182. Identify the correct ascending order of the following bacterial genera with reference to the number of cells

Monococcus
Diplococcus
I,III,I,IV
,IV,II,III

183. To which of the following nutritional groups does the bacterium commercially exploited for cleaning the water in River Ganges belong?
1) Photo autotroph
2) Photo heterotroph
3) Chemo heterotroph
4) Chemo autotroph

#### 184. Study the following table

Bacterium				Spee	cial	Economic		
				feat	ure	importance		
I)	I) Acetobacter			Pleo	morphic	Production of		
						Vinegar		
II) Beggiotoa				Rod	shaped	Causing		
						Plague		
III) Clostridium				Rod	shaped	Spoilage of		
						food		
IV) E.coli				Gram negative		Genetic		
						engineering		
						experiments		
		Whi	ch two ba	acterial s	species wi	l show the		
		corre	ect combi	nation?				
1) I & II			& II		2) I &	III		
	3) I & IV		& IV		4) I,III	,IV		
185	5.	List	- I		List - I	List - II		
		I. Ba	cillus		A. livii	A. living in the root		
					nodules of legum			
		II. Sa	almonella	l	B. Parasite on patho genic bacteria			
		III. R	hizobiun	1	C. grov	v in animals		
		IV. E	Bdellovib	io	D.grov	D.grow on decaying		
					materia	als		
		The	correct m	natch is				
			Ι	II	III	IV		
		1)	D	С	А	В		
		2)	С	D	А	В		
		3)	А	В	С	D		
		4)	В	С	D	А		

## UNIT - II MICROBIOLOGY

#### KEY

#### **INTRODUCTION**

1)2	2) 2	3) 3	4) 3	5) 2	6) 3						
7) 1	8) 2	9) 3	10) 2	11)3							
BACTERIA											
12) 1	13)3	14) 2	15)3	16) 3	17)4						
18) 3	19) 3	20) 1	21)4	22)4	23)2						
24) 1	25)2	26) 3	27)4	28) 3	29) 3						
30) 3	31)2	32) 3	33)2	34) 2	35)2						
36)2	37)2	38)4	39) 1	40) 3	41) 3						
42) 3	43) 2	44) 2	45)2	46) 2	47) 3						
48)4	49) 3	50)4	51)2	52)2	53)2						
54)4	55)2	56)4	57) 1	58)2	59)4						
60)4	61)4	62)2	63)4	64) 1	65)2						
66) 2	67) 3	68) 2	69)2	70) 3	71)4						
72) 1	73)2	74) 4	75)1	76) 3	77) 3						
78) 2	79) 1	80)4	81)1	82) 1	83)4						
84) 1	85) 1	86)4	87) 3	88) 3	89) 1						
90) 3	91) 1	92) 2	93) 3	94)2	95)4						
96) 2	97)2	98) 2									
VIRUS											
99) 3	100) 2	101)1	102) 1	103) 2	104) 2						
105)3	106) 1	107)4	108) 3	109) 3	110) 1						
111)2	112)2	113)3	114) 1	115)3	116)2						
117)4	118)4	119)2	120) 3	121) 3	122) 3						
123) 1	124) 2	125)2	126) 1	127) 2	128) 1						
129)4	130) 1	131)1	132)2	133) 3	134) 3						
135)2	136) 4	137) 3	138) 1	139) 3	140) 2						
141)4	142)2	143)4	144) 3	145) 3	146) 3						
147)2	148)4	149)4	150) 1	151)3	152) 3						
153)3	154) 3	155) 1	156) 2	157) 1	158) 4						
159)3	160) 2	161)3	162)3	163) 1	164) 2						
165)1	166) 2	167)4	168)2	169) 1	170) 1						
171)4	172)4	173)1	174) 2	175)2	176) 3						
177) 3	178) 1	179)1	180) 2	181)2	182) 1						
183) 3	184) 4	185)1									

\* \* \*