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Candidates must write the Set No. on the title page of the answer book.

**DAV PUBLIC SCHOOLS, ODISHA ZONE  
HALF YEARLY EXAMINATION, 2023-24**

- Please check that this question paper contains **10** printed pages.
- Set number given on the right hand side of the question paper should be written on the title page of the answer book by the candidate.
- Check that this question paper contains **33** questions.
- Write down the Serial Number of the question in the left side of the margin before attempting it.
- 15 minutes time has been allotted to read this question paper. The question paper will be distributed 15 minutes prior to the commencement of the examination. The students will read the question paper only and will not write any answer on the answer script during this period.

**CLASS- XII  
SUB : BIOLOGY**

Time : 3 Hours

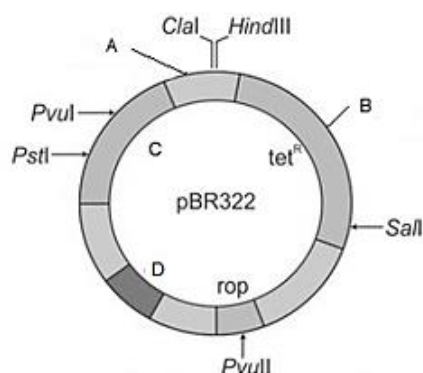
Maximum Marks : 70

**General Instructions :**

- All questions are compulsory.
- The question paper has five sections and 33 questions.
- Section–A has 16 questions of 1 mark each; Section–B has 5 questions of 2 marks each; Section–C has 7 questions of 3 marks each; Section–D has 2 case-based questions of 4 marks each; and Section–E has 3 questions of 5 marks each.
- There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.
- Wherever necessary, neat and properly labeled diagrams should be drawn.

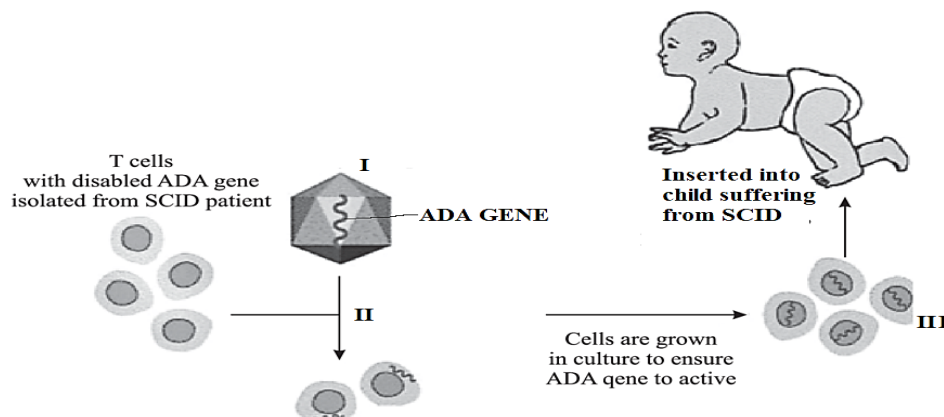
**SECTION- A**

- Cotton bollworms & corn borer are killed by the proteins encoded by the genes** **1**
  - cryIAb & cryIAc respectively
  - cryIIAb & cryIAb respectively
  - cryIAb & cryIIAb respectively
  - cryIIAb & cryIAc respectively
- Identify A, B C and D in the given figure of *E.coli* cloning vector pBR322 and select the correct option.** **1**



	A	B	C	D
a)	<i>EcoRI</i>	Ori	<i>Bam</i> HI	amp <sup>R</sup>
b)	<i>EcoRI</i>	<i>Bam</i> HI	amp <sup>R</sup>	Ori
c)	<i>Bam</i> H I	Ori	<i>EcoRI</i>	amp <sup>R</sup>
d)	<i>Bam</i> HI	<i>EcoRI</i>	amp <sup>R</sup>	Ori

3. Observe the diagram showing the steps of gene therapy and identify I, II and III. 1



Steps → Options ↓	I	II	III
a)	Disarmed retrovirus with ADA gene as cDNA	Introduction of ADA c-DNA into T-lymphocytes	Genetically modified T-cells carrying functional ADA gene
b)	Disarmed retrovirus with ADA gene as RNA	Introduction of ADA c-DNA into T-lymphocytes	Genetically modified T-cells carrying functional ADA gene
c)	Disarmed retrovirus with ADA gene as RNA	Introduction of ADA c-DNA into T-lymphocytes	Genetically modified T-cells carrying non-functional ADA gene
d)	Disarmed retrovirus with ADA gene as cDNA	Introduction of ADA c-DNA into T-lymphocytes	Genetically modified T-cells carrying non-functional ADA gene

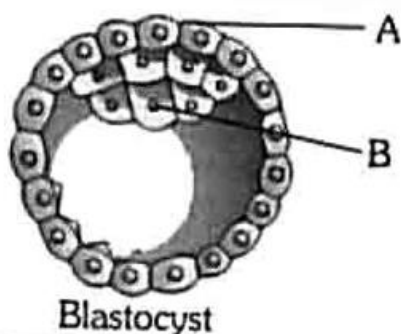
4. Enclosed within the integuments of a typical anatropous ovule is a diploid mass of cellular tissue known as: 1

- a) Synergids                      b) Megaspore Mother cell      c) Nucellus                      d) Embryo sac

5. In angiosperms, perisperm differs from endosperm in 1

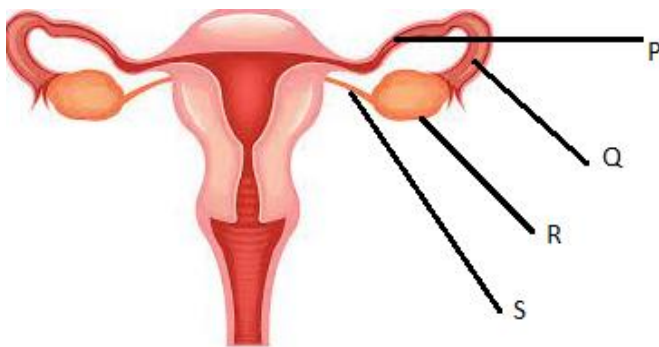
- a) being a diploid tissue      b) its formation by fusion of secondary nucleus with several sperms  
c) being a haploid tissue      d) having no reserve food.

6. Select the right option in which A and B are correctly identified with their respective functions, 1



	A	B	Function of A	Function of B
a)	Ectoderm	Endoderm	differentiated as embryo	gets attached to the endometrium
b)	Trophoblast	Inner cell mass	differentiated as embryo	gets attached to the endometrium
c)	Inner cell mass	Trophoblast	gets attached to the endometrium	differentiated as embryo
d)	Trophoblast	Inner cell mass	gets attached to the endometrium	differentiated as embryo

7. You might have seen advertisements in the media as well as in posters showing a happy couple with the slogan “*Hum do humare do*”. So one female partner of a married couple decides to adopt the surgical method of contraception. Identify the point in the following diagram where a cut would be made and tied.

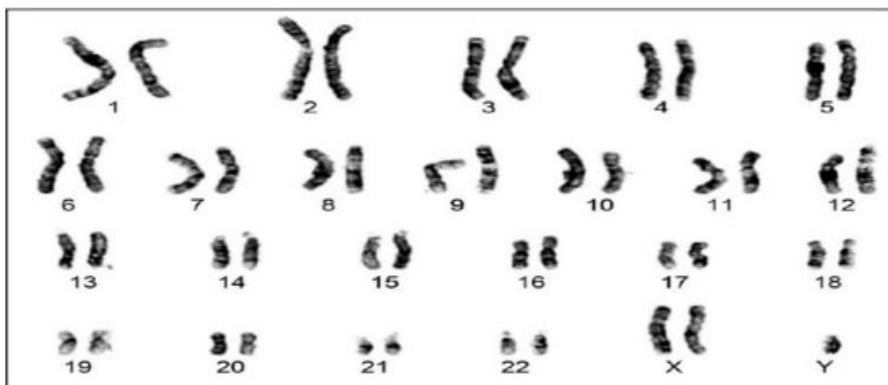


1

- a) Point P                      b) Point R                      c) Point S                      d) None of the these
8. *E. coli* bacteria grown in  $^{15}\text{NH}_4\text{Cl}$  medium for several generations were allowed to grow in  $^{14}\text{NH}_4\text{Cl}$  medium. After 2 generations, the bacteria were isolated and centrifuged in  $\text{CsCl}$  density gradient. The result would be
- a) both heavy and light DNA                      b) only hybrid DNA  
c) both hybrid and light DNA                      d) both hybrid and heavy DNA
9. The following karyotype of the patient shows some abnormality. Identify the option which represents the correct symptom(s) related to the abnormality.

1

1



- a) Broad palm with characteristics palm crease                      b) Gynaecomastia  
c) Rudimentary ovaries                      d) Anaemia

10. Given below are the functions of different enzymes.

1

Name of the Enzyme	Function
(A) Reverse Transcriptase	(i) Synthesize RNA from DNA
(B) DNA polymerase	(ii) Tyrosine formation
(C) RNA polymerase	(iii) Synthesizes DNA from DNA
(D) phenyl alanine hydroxylase	(iv) Synthesizes DNA from RNA

Select the correct match.

	A	B	C	D
a)	(i)	(ii)	(iii)	(iv)
b)	(ii)	(i)	(iii)	(iv)
c)	(iv)	(ii)	(i)	(iii)
d)	(iv)	(iii)	(i)	(ii)

11. Identify the option that gives the correct type of evolution exhibited by the two animals living in the same habitat in Australia.

1



- a) Convergent evolution  
c) Divergent evolution

- b) Disruptive selection  
d) Homologous Ancestry

12. Which one of the following immune system components does not correctly match its respective role?

1

- a) Interferons - Secreted by virus-infected cells and protect non-infected cells from further viral infections.  
b) B-lymphocytes - Produce antibodies in response to pathogens into the blood to fight with them.  
c) Macrophages - Mucus-secreting cells that trap microbes entering the body.  
d) IgA - Present in colostrum in the early days of lactation to protect infants from diseases.

Question No. 13 to 16 consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

- a) Both A and R are true and R is the correct explanation of A.  
b) Both A and R are true but R is not the correct explanation of A.  
c) A is true but R is false.  
d) A is false but R is true.

13. Assertion: For gene cloning, human genes are often transferred into bacteria or yeast with suitable vectors.

Reason: Polymerase Chain Reaction is a method of *in-vitro* gene cloning.

1

14. Assertion : In apomixis, offspring's have same genetic sequence as their parent plant.

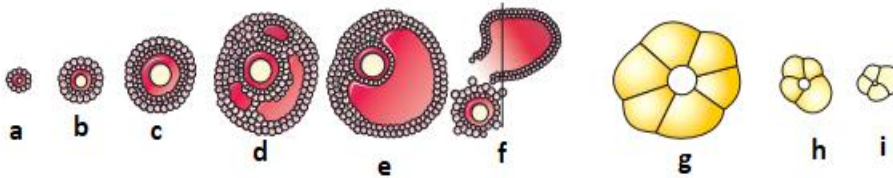
1

Reason: Two plants of same genetic sequence are hybridized to get apomictic varieties.

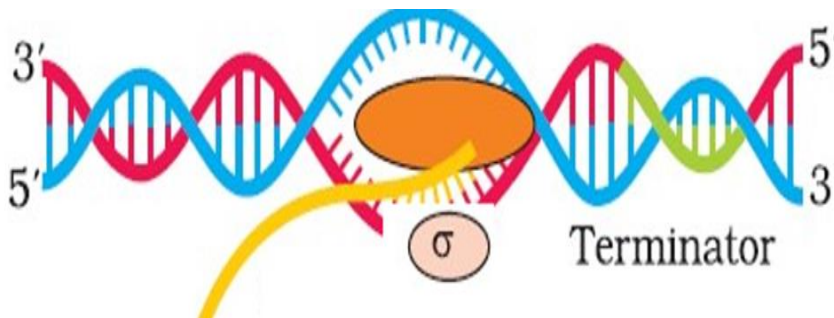
15. Assertion: In birds the sex of the offspring depends on the type of the egg fertilized by the sperm. Reason- In birds females are heterogametic and males are homogametic. 1
16. Assertion: In mycorrhiza the fungus symbiont absorbs phosphorous from the plant. Reason: Mycorrhiza is a symbiotic association of fungus with roots of higher plants. 1

**SECTION -B**

17. Application of Biotechnology has a great importance in the field of medicine. Illustrate this with reference to production of Humulin by Eli Lilly company. 2
18. The diagram given below shows the ovarian events during the menstrual cycle and answer the following questions based on it. 2



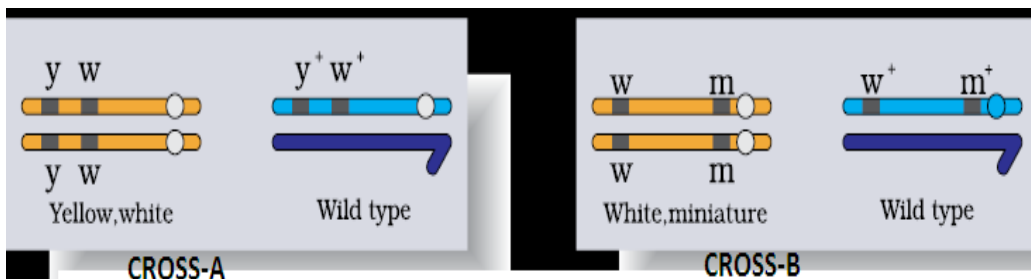
- a) Mention the event 'f' and name the hormone that influences it.
- b) Identify 'g' in the above diagram and name the hormone produced from it.
19. Observe the diagram given below and answer the questions that follows: 2



- a) Name the mechanism shown in the above diagram and mention the site where it takes place in prokaryotes.
- b) Write the polarity of DNA polynucleotide chain/chains that can act as template strand.
- c) Name the molecules that act as substrate in the above process.

**OR**

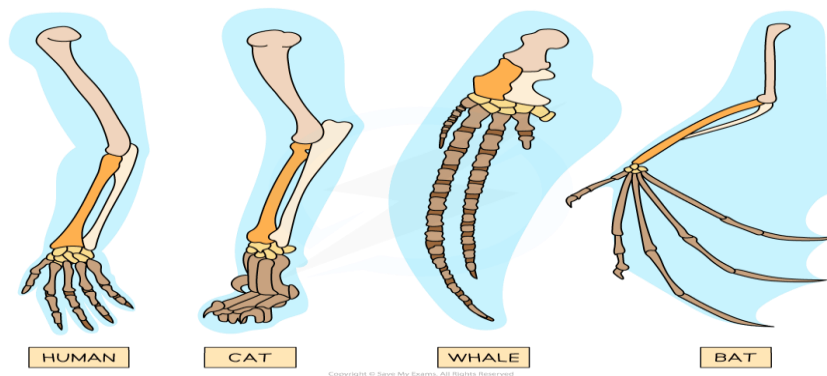
- a) Identify in which one of the two crosses given below, the chances of crossing over between the genes is higher. Give reason(s) in support of your answer.



- b) Write the genotype of females produced in F<sub>1</sub> generation for cross A and cross B respectively.

20. Observe the diagram and answer the following.

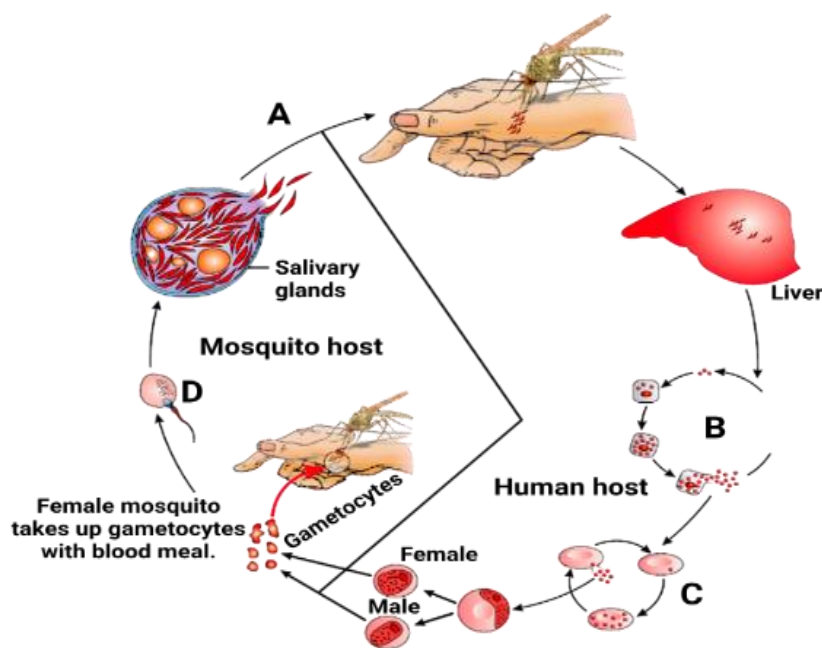
2



- Identify the type of evolution shown in the given diagram and justify your answer.
- Give an example of such type of evolution in plants.

21. Study the life cycle of malarial parasite and answer the questions.

2



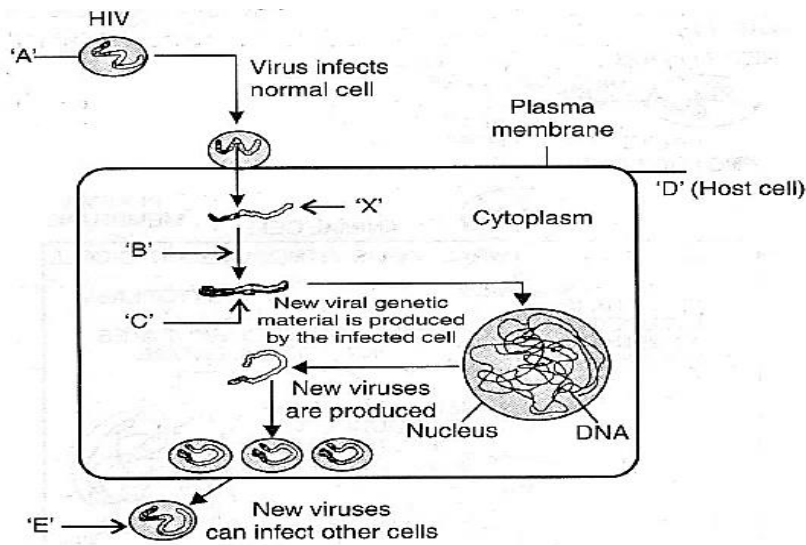
- Identify the stage 'A' that gains entry in to human body.
- Mention the type of reproduction taking place in 'B'.
- The rupture of 'C' is associated with release of a substance responsible for chills and high fever. Name it.
- Name the site where event 'D' is taking place.

### SECTION- C

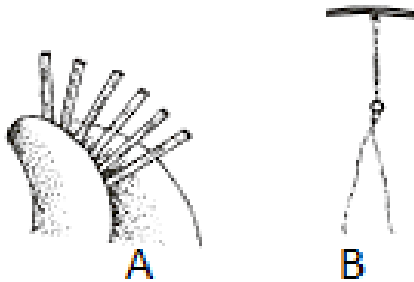
22. a) It is generally observed that the children who had suffered from chickenpox in their childhood may not contract the disease in their adulthood. Explain giving reasons the basis of such immunity in an individual. Name the kind of immunity. 3
- b) Why is a person with cuts and bruises following an accident administered tetanus antitoxin. Give reasons.

OR

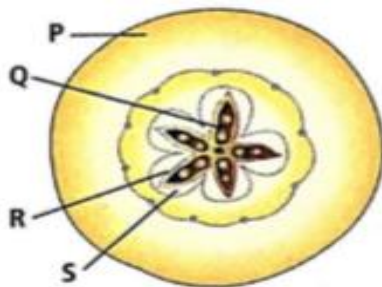
Study the diagram showing replication of HIV in humans and answer the following questions accordingly.



- Write the chemical nature of the coat 'A'.
  - Name the enzyme 'B' acting on 'X' to produce molecule 'C'. Name 'X' and 'C'.
  - Mention the name of the host cell 'D' the HIV attacks first when it enters the human body.
  - Name the cells the new virus 'E' subsequently attacks.
23. a) The most important step to control population growth is to motivate smaller families by using various contraceptive methods. Following are images of some contraceptives. 3

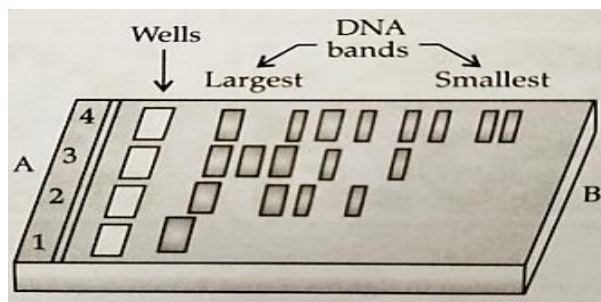


- Identify 'A' and 'B'.
  - What is the principle behind the use of 'A' and 'B'?
- b) All reproductive tract infections (RTIs) are sexually transmitted diseases (STDs) but all STDs are not RTIs. Justify.
24. Observe the T.S. of a fruit given in the diagram and answer the following questions. 3



- Identify P, Q, R & S in it.
- Name the type of fruit does it represent. Justify your answer.

25. Following the collision of two trains a large number of passengers are killed. A majority of them are beyond recognition. Authorities want to hand over the dead to their relatives. Name a modern scientific method and write the procedure that would help in the identification of kinship. **3**
26. a) In a region due to earthquake the heterozygous individuals (Aa) are lost from the population. In which way it is going to affect Hardy Weinberg equilibrium? Explain. **3**  
 b) Give the equation for Hardy Weinberg equilibrium.  
 c) Natural selection can have various effects in a population. Explain disruptive selection with the help of a diagram.
27. a) Write the first step the primary effluent undergoes when it enters the secondary treatment plant and state the purpose. **3**  
 b) Mention the role(s) of activated sludge in the biological treatment of sewage.  
 c) The last step of sewage treatment involves production of biogas. Explain.
28. Observe the diagram of gel electrophoresis & answer the following questions. **3**



- a) Why are DNA fragments seen to be moving in the direction A → B?  
 b) Name the medium used on which DNA fragments separate. Write its source.  
 c) Mention how the separated DNA fragments can be visualized and extracted.

#### SECTION -D

29. When drugs and alcohol are taken for purposes other than medicinal or taken in amounts or frequencies that impairs physical, physiological or psychological functions, it is called drug abuse and alcohol abuse respectively. Drugs belong to various categories and obtained from different sources. **4**  
 Observe the following diagram and answer the questions that follows:



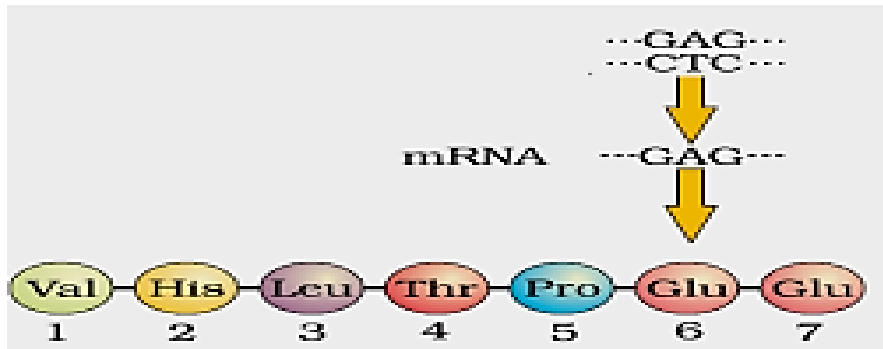
- a) Identify the above figure and mention the type of drug that is obtained from it.  
 b) Mention any two medical applications of the drugs such as barbiturates and amphetamines.  
 c) The drug, commonly called as coke or crack has potent stimulating action on our body. Mention the scientific name of its source plant and state its mode of action. Name the body part that is mostly affected by this drug and mention the effect in case of excessive intake.

**OR**

- c) Write the common name of Heroin and mention how it is obtained chemically. Write the category of the drug and its effect on human body.



30. Genetic disorders may be caused due to alteration /mutation in a particular gene. The disorder may be autosomal or sex-linked, it may be dominant or recessive. Observe the given diagram and answer the following questions: 4



- What does the diagram represent?
- How it differs in a sufferer related to this sequence and state its cause.
- Mention the physiological changes that occur in the sufferer and write the type of inheritance observed.

**OR**

- Who are likely to suffer more from the defect related to the gene represented in the above diagram (males, females or both). Give reasons in support of your answer. Mention the genotypes of the parents and sufferer in such cases.

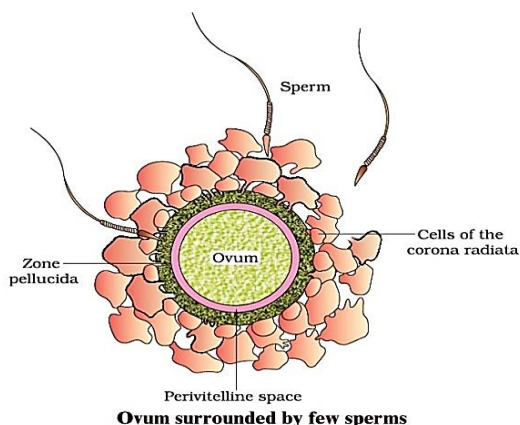
### SECTION -E

31. a) Diagrammatically represent the steps in formation of recombinant DNA by action of restriction endonuclease *EcoRI*. 5
- b) Selection of recombinants due to inactivation of antibiotics is a cumbersome process. Suggest and explain a better method by which selection of recombinants will be easier.

**OR**

The diversity of rice in India is one of the richest in the world. There are an estimated 2,00,000 varieties of rice grown in India alone. Among these Basmati rice is distinct for its unique aroma and flavour. In 1997, an American company got patent rights on Basmati rice, which allowed the company to sell a 'new' variety of Basmati in the U.S and abroad.

- How many documented varieties of Basmati are grown in India?
  - How has the U.S company got patent related to Basmati rice?
  - Name two other medicinal plants for which MNCs have been attempting to get patents.
  - Name and define the term given to such unauthorized practices.
  - What has the Indian government done to prevent such deeds?
32. **Given below is the diagram of a human ovum surrounded by a few sperms. Observe the diagram and answer the following questions.** 5



- a) Mention the fate of sperms shown in the above diagram.
- b) What is the role of zona pellucida in the above process?
- c) Analyse the changes that occur in the ovum during the process.
- d) Mention what help the entry of sperm into ovum.
- e) Specify the region of female reproductive system where the events represented in the diagram takes place. Write the product formed in the given process and mention its ploidy.

**OR**

- a) Plan an experiment and prepare a flow chart of the steps that you would follow to ensure that seeds are formed only from the desired sets of pollen grains in a monoecious plant bearing unisexual flowers. Name the type of experiment that you carried out.
- b) A monoecious plant is producing bisexual flowers. The stigma receptivity and release of pollen grain occur at same time. The stigma and anther are present on different positions. Which other alternative the flowering plant should develop to inhibit self-pollination and ensure cross pollination? Comment.
- c) What are chasmogamous flowers? Can cross-pollination occur in cleistogamous flowers? Give reasons for your answer.

**33. Answer the following questions based on Hershey Chase experiment.**

**5**

- a) Name the kind of viruses they worked with & why?
- b) Why did they use two types of culture media to grow viruses in? Justify.
- c) What is the need of using a blender & later a centrifuge during their experiments.
- d) State the conclusion drawn by them after the experiment.

**OR**

A cross was carried out between homozygous tall pea plant with green seeds with a homozygous dwarf pea plant with yellow seeds to obtain  $F_1$  generation. The  $F_1$  progeny was later selfed to obtain the  $F_2$  generation. Perform the cross with Punnett square and answer the following questions.

- a) Write the possible phenotype and genotype of  $F_1$  generation.
- b) Mention the  $F_2$  phenotypic ratio with their possible phenotypes.
- c) Write the genotypes of male and female gametes produced by  $F_1$  progeny.
- d) State and explain the laws of Mendel that can be derived from this cross but not from a monohybrid cross.