Class XII Session 2026-27
Subject - Biology
Sample Question Paper - 3

Time Allowed: 3 hours **Maximum Marks: 70**

General Instructions:

1. 1All questions are compulsory.
2. The question paper has five sections and 33 questions. All questions are compulsory.
3. 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.
4. 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.
5. Wherever necessary, neat and properly labeled diagrams should be drawn.

Section A

1. A female undergoing IVF treatment has blocked fallopian tube. The technique by which the embryo with more than 8 blastomeres will be transferred into the female for further development is: **[1]**

   a) IUT
   b) AI
   c) GIFT
   d) ZIFT

2. The total number of species, that are known and described range between: **[1]**

   a) 1.7 - 1.8 million
   b) 1.1 - 1.2 million
   c) 2.5 - 3.0 million
   d) 0.5 - 1.0 million

3. What is function of copper-T? **[1]**

   a) Stops cleavage
   b) Stops gastrulation
   c) Stops fertilization
   d) Checks mutation

4. Restriction endonucleases are so called because they: **[1]**

   a) Breakdown DNA molecule at random
   b) Restriction nuclear activity
   c) Cleave DNA molecules into smaller pieces
   d) Synthesize DNA

5. Nitrogen fixation is: **[1]**

   a) $N_2 \rightarrow NH_3$
   b) $N_2 \rightarrow$ Amino acid

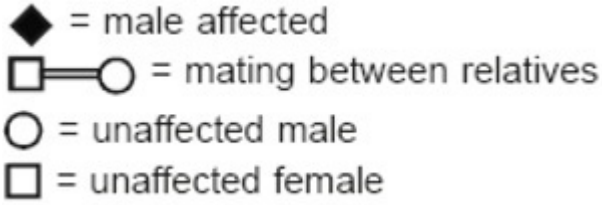
c) $N_2 \rightarrow NO_3$ d) Both $N_2 \rightarrow NH_3$ and $N_2 \rightarrow NO_3$

6. Which of the following will be incorrect about the concept of the ecosystem? **[1]**

a) The ecosystem is an open unit. b) All ecosystems are equal in size.

c) Ecosystems can also be classified as temporary and permanent. d) Ecosystem is a functional unit of nature.

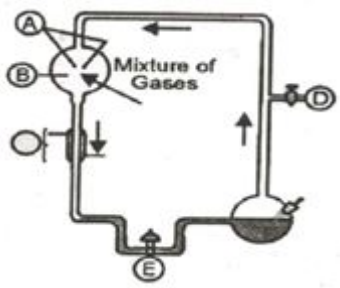
7. Which one of the following symbols and its representation used in the human pedigree analysis is correct? **[1]**



a) Mating between relatives b) unaffected female

c) affected male d) unaffected male

8. What was the resultant found in the place marked E? **[1]**



a) Organic esters only b) Some fatty acids and organic acids

c) Some amino acids as glycine and alanine d) Glucose, fatty acids and lipids

9. The testes in humans are situated outside the abdominal cavity inside a pouch called scrotum. The purpose served is for: **[1]**

a) Providing more space for the growth of epididymis.

b) Providing a secondary sexual feature for exhibiting the male sex.

c) Escaping any possible compression by the visceral organs.

d) Maintaining scrotal temperature lower than the internal body temperature.

10. AIDS was first discovered in: **[1]**

a) 1981 in Asia b) 1984 in America

c) 1984 in France d) 1981 in America

11. Cyanobacteria serves as important biofertilizers in the fields of: **[1]**

a) Rice b) Wheat

c) Maize d) Sugarcane

12. Which of the following is not required in the preparation of a recombinant DNA **[1]**

molecule?

a) DNA ligase
b) DNA fragments
c) E.coli
d) Restriction endonuclease

13. **Assertion (A):** There is a statutory ban amniocentesis on sex determination in India. **[1]**
Reason (R): Amniocentesis is used to determine the sex of foetus for female foeticide.

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.

14. **Assertion (A):** Champagne gives off bubbles. **[1]**
Reason (R): Alcoholic content is 12-16% in champagne.

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.

15. **Assertion (A):** The ecosystem shows only negative feed back system. **[1]**
Reason (R): Resilience is the ability of a system to tolerate disturbances.

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.

16. **Assertion (A):** Primitive atmosphere was formed by the lightest atoms. **[1]**
Reason (R): The primitive atmosphere was reducing in nature.

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.

Section B

17. Explain the role of pituitary and ovarian hormones in the menstrual cycle of human females. **[2]**

OR

Draw the following diagrams related to human reproduction and label them:

a. The zygote after the first cleavage division
b. Morula stage
c. Blastocyst stage (sectional view)

18. Name two organisms belonging to two different kingdoms, that are commonly used as biofertilizers, and how? **[2]**

19. a. Write the scientific names of the source plants from where opioids and canabinoids are extracted. **[2]**
b. Write their receptor sites in the human body. How do these drugs affect the human beings?

20. Distinguish between gross primary productivity and net primary productivity. **[2]**

OR

a. Mention the difference between the **R** strain and **S** strain in Streptococcus pneumoniae.

b. Write the steps followed by Griffith during the course of his experiment and the conclusion he arrived at, at the end of his experiment.

21. State the impact of constant mechanical agitation and pumping of air in the aeration tank on the sewage during the biological treatment. **[2]**

OR

Curd is easier to digest by humans than milk. Justify, giving two suitable reasons.

Section C

22. Draw a labelled diagram of a 'replicating fork' showing the polarity. Why does DNA replication occur within such 'fork'? **[3]**

23. Answer the following questions with respect to the sex determination mechanism in birds: **[3]**

a. Name the type of heterogamety observed in most birds.

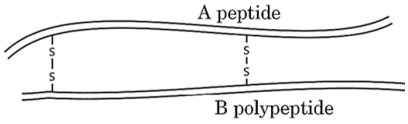
b. If the birds have 18 pairs of autosomal chromosomes and a pair of sex chromosomes, fill in the blanks (i), (ii), (iii) and (iv) in the table given below. (Use symbols Z and W for sex chromosomes.)

	Total number of autosomes (in a diploid cell)	**Type of sex chromosomes (in a diploid cell)**
Male bird	(i) _____	(ii) _____
Female bird	(iii) _____	(iv) _____

24. a. What does the equation $\frac{dN}{dt}$ = rN express in terms of population growth? **[3]**

b. Write the significance of **r** in a population survey.

25. A schematic diagram of matured human insulin is given below: **[3]**



How is the process of its formation naturally in the human body different from that of its formation by rDNA technology? Explain.

26. a. Enlist two criteria that are used to identify a region for maximum protection as **Biodiversity hotspots**. **[3]**

b. Name any two **hotspot** regions in our country.

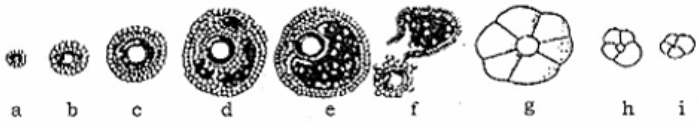
27. Explain the three different ways in which natural selection operates. Explain with the help of graphs. **[3]**

28. How are primary and secondary immune responses carried out in the human body? Explain. **[3]**

Section D

29. **Read the following text carefully and answer the questions that follow:** **[4]**

The following is the illustration of the sequence of ovarian events (a-i) in a human female.



i. Identify the figure that illustrates ovulation and mentions the stage of oogenesis it represents. (1)

ii. Name the ovarian hormone and the pituitary hormone that have caused the above-mentioned event. (1)

iii. Explain changes that occur in the uterus simultaneously in anticipation. (2)

OR

Draw a labelled sketch of the structure of a human ovum prior to fertilization. (2)

30. **Read the following text carefully and answer the questions that follow:** **[4]**

Siddharth is a chain smoker, he got into this habit in early adolescent due to peer pressure and gradually got addicted in this habit. It is now 20 yrs., he is into the habit of smoking since few months he is experiencing pain in chest, shortness of breathing, wheezing and chronic cough with phlegm.

He sought advice of medical practitioner who diagnosed him with lung cancer.

i. Enumerate the two properties of cancer cells. (1)

ii. How is lung cancer diagnosed? (1)

iii. What do you mean by carcinogen? Give some examples. (2)

OR

Differentiate between two different types of tumours. (2)

Section E

31. Trace the development of a 2-celled pollen grain of an angiosperm within an anther. Draw a labelled diagram to substantiate your answer. **[5]**

OR

a. Explain the process of syngamy and triple fusion in angiosperms.

b. Trace the development of the product of syngamy upto its mature stage in a dicot plant.

c. Draw and label three important parts of a mature dicot embryo.

32. Meselson and Stahl carried out an experiment to prove the nature of DNA replication. Recall the experiment and answer the following questions. **[5]**

i. Which two types of nitrogen were used by them in their experiment and why?

ii. Why did they take samples of E. coli at definite time intervals for their observation?

iii. State the role of caesium chloride density gradient in their experiment.

iv. Write the conclusions they arrived at.

OR

In a particular cattle, the coat colour red and white are controlled by single pair of alleles. A calf that receives allele for red coat from mother and allele for white coat from father shows equal number of red and white hairs on its coat.

i. Is this an example of Co-dominance or incomplete dominance. Give a reason for your answer.

ii. With the help of a genetic cross upto F_2 generation, explain what will be the consequent phenotype of calf when

a. Red is dominant over white,

b. Red is incompletely dominant.

33. i. Why must a cell be made 'competent' in biotechnology experiments? How does calcium ion help in doing so? **[5]**

ii. State the role of 'biolistic gun' in biotechnology experiments.

OR

i. Insertional inactivation is a method to detect the recombinant DNA. Explain this method.

ii. Name the commonly used vector for transferring genes in plants from bacteria.

iii. How is this able to transform a normal plant cell into a tumour?

Solution

Section A

1. **(a)** IUT
   Explanation:
   In IVF the choice of transfer method depends on what is being transferred and where it must be placed. GIFT (gamete intrafallopian transfer) places eggs and sperm into the fallopian tube, and ZIFT (zygote intrafallopian transfer) places the fertilized zygote into the tube - both require a patent fallopian tube and so are unsuitable when the tube is blocked. IUT (intrauterine transfer or embryo transfer) is the procedure in which an embryo at the cleavage stage (typically an embryo of about 8 or more blastomeres) is placed directly into the uterine cavity for further development. AI (artificial insemination) involves placing sperm, not embryos, and therefore is not applicable. Because the patient has blocked tubes and the embryo has more than 8 blastomeres (cleavage-stage embryo), the appropriate technique is IUT.

2. **(a)** 1.7 - 1.8 million
   Explanation:
   1.7 - 1.8 million

3. **(c)** Stops fertilization
   Explanation:
   Stops fertilization

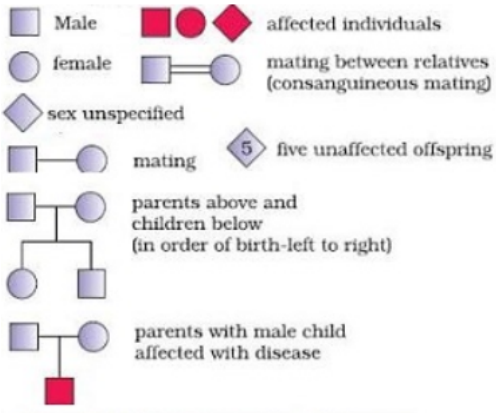
4. **(c)** Cleave DNA molecules into smaller pieces
   Explanation:
   Cleave DNA molecules into smaller pieces

5. **(d)** Both $N_2 \rightarrow NH_3$ and $N_2 \rightarrow NO_3$
   Explanation:
   Both $N_2 \rightarrow NH_3$ and $N_2 \rightarrow NO_3$

6. **(b)** All ecosystems are equal in size.
   Explanation:
   Ecosystem is a functional unit of nature. It is an open unit in which energy can flow in or outside the ecosystem. Ecosystem may be temporary or permanent but the size of ecosystems are not the same always.

7. **(a)** Mating between relatives
   Explanation:

The symbols and its representation used in the human pedigree analysis is mating between relatives is correct.



8.

(c) Some amino acids as glycine and alanine

Explanation:

In Urey and Miller's experiment, the product formed after the continuous sparking in the mixture of gases at high temperature were some amino acids like glycine and alanine. Sugar and nitrogenous base were also obtained from the same set up by some other scientist.

9.

(d) Maintaining scrotal temperature lower than the internal body temperature.

Explanation:

Maintaining scrotal temperature lower than the internal body temperature.

10.

(d) 1981 in America

Explanation:

1981 in America

11. **(a)** Rice

Explanation:

Rice fields contain water all the time. In this water, Cyanobacteria grows easily that have the ability to fix atmospheric nitrogen into nitrates and nitrites that increase fertility.

12.

(c) E.coli

Explanation:

E.coli acts as a host to multiply the recombinant DNA. While forming a recombinant DNA we need a restriction enzyme that will cut out the required DNA fragments which are later joined with the help of DNA ligase.

13. **(a)** Both A and R are true and R is the correct explanation of A.

Explanation:

The statutory ban on amniocentesis for sex determination is due to increasing female foeticide after knowing the sex of the baby using the chromosomal pattern of amniotic fluid surrounding the foetus.

14.

(b) Both A and R are true but R is not the correct explanation of A.

Explanation:

Champagne wines are bottled before fermentation is complete. These wines give off bubbles of gas. Alcohol content is 12-16%.

15.

(d) A is false but R is true.

Explanation:

In feed back system, one living component of the ecosystem controls the population of another living component. Feedback system is of two types-positive and negative. The example of positive feed back is the increase in population of herbivorous insects with the increase in plant matter. The increased population of insectivorous animals would, however soon exert a negative feed back on the population of herbivorous insects through excessive predation. Resilience is the ability of a population, community or system to tolerate disturbance caused by changes in weather, physico-chemical factors and biotic factors.

16.

(b) Both A and R are true but R is not the correct explanation of A.

Explanation:

The lightest atoms of nitrogen, hydrogen, carbon etc. formed the primitive atmosphere. Free atoms combined to form molecules and simple inorganic compounds. Hydrogen atoms were most numerous and most reactive in primitive atmosphere. First hydrogen atoms combined with all oxygen atoms to form water and leaving no free oxygen. Thus primitive atmosphere was reducing atmosphere (without free oxygen) unlike the present oxidising atmosphere (with free oxygen). Presence of huge amount of free hydrogen in primitive atmosphere also proves its reducing nature.

Section B

17. The menstrual cycle in human females is regulated by a complex interplay of hormones, primarily involving the pituitary gland and the ovaries. Below given are the roles of each of them:

(Pituitary hormones) - Gonadotropins / FSH - causes follicular development, secretion of estrogen (by growing follicles)

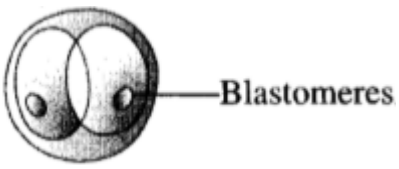
LH - induces rupture of Graafian follicle/ovulation, remaining part of Graafian follicle transform into corpus luteum which releases progesterone

(Ovarian hormone) - Estrogen causes growth and maturation of follicle and is necessary for repair of endometrium

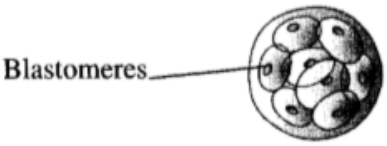
Progesterone - necessary for maintenance of the endometrium for implantation

OR

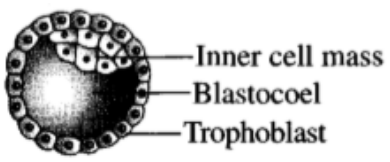
i.



ii.



iii.



18. Biofertilizers are substances that contain microbes, which help in improving the growth of plants and trees by increasing the supply of essential nutrients to the plants. They include mycorrhizal fungi, blue-green algae and bacteria.

19. a. Papaver sominiferum, Cannabis sativa
    b. In the brain of human body
    Effect on the cardiovascular system

20. **Gross Primary Productivity (GPP):**
    - It is the amount of organic matter synthesized by producers per unit area in unit time.
    - It refers to the total productivity including the energy utilized for respiration by the producers.
    - It depends on chlorophyll content.
    - GPP = Rate of increase in body wt or rate of organic matter synthesized by producers + the rate of respiration (R)and other damages.

    Net Primary Production (NPP):
    - It is the amount of organic matter stored by producers per unit area in unit time.
    - It refers to the net productivity that is converted to organic matter excluding the energy utilized for respiration (R) by the producers.
    - It depends on chlorophyll content.
    - NPP= Rate of organic matter synthesized by photosynthesis by producers - the rate of energy utilized for respiration (R) and other damages.

OR

a.

'R' Strain	'S' Strain
Non-Virulent	Virulent
No polysaccharide coat	Have polysaccharide coat

b. S strain → Inject into mice → Mice die
R strain → Inject into mice → Mice live
S strain (heat killed) → Inject into mice → Mice live
S strain (heat killed) + R stain → Inject into mice → Mice die
Conclusion: He concluded that the R strain bacteria had somehow been transformed by the heat-killed S strain bacteria/Some 'transforming principle' transferred from heat killed S strain and transform R strain into S strain.

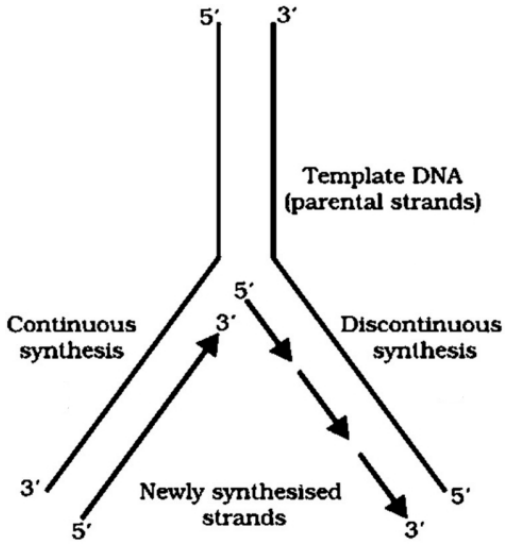
21. Constant mechanical agitation and pumping of air in the aeration tank enhance the aerobic biodegradation of the organic wastes. Agitation ensures the formation of bubbles in the sludge and as a result air and oxygen gets added to it.

OR

i. LAB produce acids that coagulate milk
ii. Partially digests milk proteins

Section C

22. •



- Replication of DNA occurs in small replication fork because DNA being a long molecule separation of the two strands along its entire length requires a very high amount of energy.

23. a. female heterogamety/ ZW

b. i. Male bird-36
ii. ZZ
iii. Female bird -36
iv. ZW

24. a. It indicates exponential / geometric growth

b. Assesses impact of biotic and abiotic factors on population growth, indicates intrinsic rate of natural increase.

25. **Insulin production in human body:**

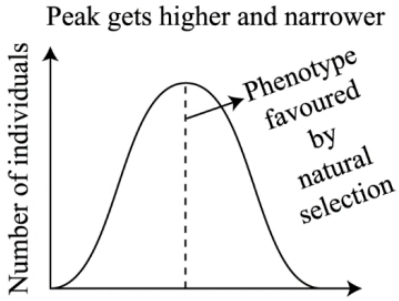
- Synthesised naturally in the form of proinsulin consisting of polypeptide chain A and polypeptide chain B, linked together by disulphide bonds and an extra stretch called C-peptide
- The C-peptide is removed during processing and proinsulin matures into functional insulin.

Insulin production by rDNA technology

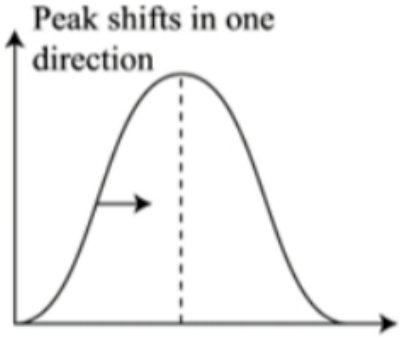
- Two DNA sequences corresponding to chain A and chain B of human insulin are synthesised
- They are introduced into two different plasmids of E.coli
- Chain A and chain B are produced separately
- extracted and combined by disulphide bond to form human insulin.

26. i. (i) High degree of endemism, (ii) high levels of species richness
ii. Western Ghats, Himalaya, Indo-Burma

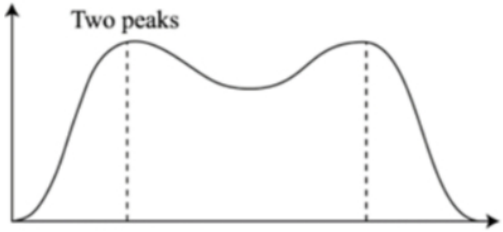
27. - **Stabilising -** more individuals acquire the mean character value i.e variation is much reduced.



- **Directional -** more individuals acquire value other than the mean character value.



- **Disruptive -** more individuals acquire peripheral character value at both ends of the distribution curve two peaks are formed.



28. The primary response is the first response of the immune system to a newly introduced foreign agent, while a second intensified immune response to the same foreign agent is the secondary or anamnestic response. Immune responses are produced by two types of lymphocytes.

i. **B-lymphocytes** These produce an army of proteins in response to pathogens, i.e. antibodies in the blood. The different types of antibodies secreted are IgA, IgM, IgE and IgG. This response generated via antibodies of the immune system is also called the humoral immune response.

ii. **T-lymphocytes** are the mediators of the cell-mediated immunity (CMI). The cell-mediated immune response is responsible for graft rejection.

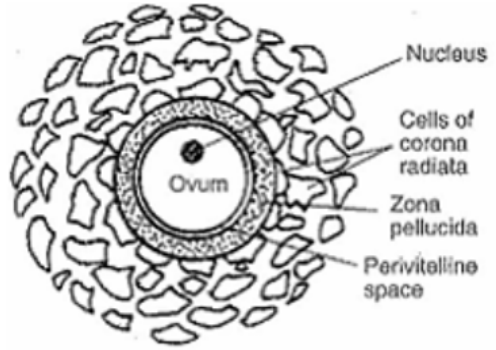
Section D

29. i. Figure f illustrates ovulation.

ii. It represents secondary oocyte stage of oogenesis.
-Pituitary hormone -LH

iii. Endometrium proliferates and becomes thicker by rapid cell multiplication development and maturation of ovum is in progress, while the figure 'h' shows that corpus luteum going towards degeneration.

OR



30. i. a. Loss of contact inhibition
b. Development of abnormal cells that divide uncontrollably.

ii. CT scan and MRI, x- rays (all relevant points)

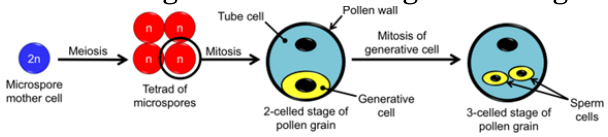
iii. Agents which causes transformation of normal cell into the cancerous cell. Physical (x - ray), chemical (etbr), biological (herpes virus).

OR

The benign tumour is a non-cancerous tumour. These cells don't spread to other tissues or organs and don't invade other areas of the body. Malignant tumour is a cancerous tumour, shows metastasis.

Section E

31. 1. While the development of 2-celled pollen grain of an angiosperm within an anther, each cell of sporogenous tissue develops into a microspore mother cell, that undergoes the process of meiosis forming four cells that is microspore tetrad, and mature pollen grain contains two cells the vegetative cell along with the generative cell.

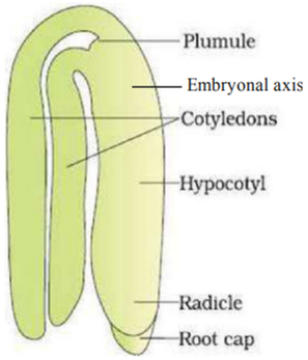
2. 

OR

a. Fusion of the male gamete with the nucleus of the egg cell is called syngamy, this results in the formation of the diploid zygote
Fusion of a male gamete with two polar nuclei, to produce triploid primary endosperm nucleus is called triple fusion. **or** One sperm cell fuses with the two polar nuclei, resulting in the formation of a triploid (3n) nucleus. This fusion event is known as triple fusion.

b. The zygote divides mitotically at the micropylar end, (only after certain endosperm is formed) to give rise to proembryo, subsequently to mature embryo (globular and heart shaped)

c.



32. i. Two types of nitrogen were used by them in their experiment are Normal nitrogen/^{14}N, heavy nitrogen/^{15}N to produce two types of DNA/light and heavy DNA respectively.

ii. E. coli has generation time of 20 minutes so the samples taken at intervals of 20 minutes, to understand the mode of replication when E.coli with ^{15}N DNA was cultured in medium ^{14}N (normal) nitrogen.

iii. To distinguish or separate heavy DNA from light DNA on the basis of density.

iv. Mode of DNA replication is semiconservative.

OR

i. Co-dominance, as two different alleles for a genetic trait are able to express / both characters are expressed equally.

a. **Red is dominant over white**

if pure breeding red coat cattle are represented as 'RR' and pure breeding white coat cattle as 'rr'. Then

RR (Red coat) X rr (White coat)

Gametes: R R r r

F_1 generation — Rr (All with red coat)

Rr X Rr

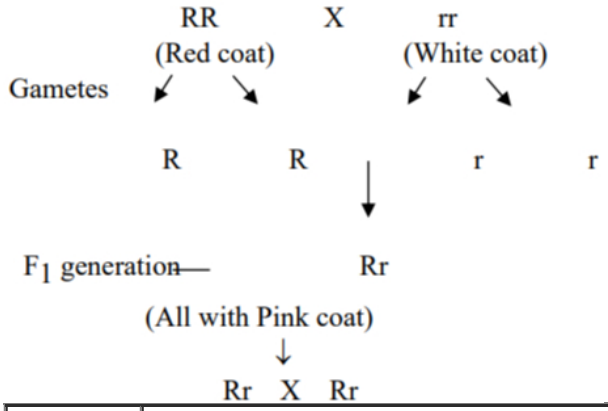
R r

F_2 generation

	R	r
R	RR Red coat	Rr Red coat
r	Rr Red coat	rr White coat

F_2 phenotypic ratio: 3 Red Coat: 1 White Coat

b. **Red is incompletely dominant**



	R	**r**
R	RR Red coat	Rr Pink coat
r	Rr Pink coat	rr White coat

F_2 phenotypic ratio: 1 Red : 2 Pink : 1 White

33. i. Since, DNA molecules are hydrophilic, they cannot pass through cell membranes. For recombinant DNA to be integrated into the vector or host genome, it is necessary for the DNA to be inserted in the cell. Therefore, making the host cells competent is necessary for biotechnology experiments.

The two ways by which cells can be made competent to take up DNA are:

a. **Chemical action** -The host cell is treated with a specific concentration of divalent cation, i.e. calcium which increases the pore size in the cell membrane. DNA is then incubated with the treated bacterial cell at 42°C, thereby increasing the efficiency of DNA entering through pores in the cell wall.

b. **Heat shock treatment-** Incubating the cells with recombinant DNA on ice, followed by a brief treatment of heat at 42°C and again putting them back on ice.

ii. Biolistic guns or gene guns are used to bombarded rDNA loaded on gold or tungsten particles with high velocity. In this way, the rDNA is delivered to the desired host cells.

OR

i.
- When the alien DNA is inserted within the coding sequence of the enzyme β -galactosidase it results in inactivation of the enzyme which is referred as insertional inactivation.
- The presence of chromogenic substrate gives blue coloured colonies if the plasmid in the bacteria does not have insert or is non recombinant.
- Colonies which do not produce any colour are identified as recombinants as their gene for enzyme is inactivated due to an insert.

ii. Agrobacterium tumefaciens.

iii. When this Agrobacterium infects a plant cell it delivers 'T'-DNA or Ti tumor inducing plasmid into the plant cell and transforms it into a tumor cell.