Class XII Session 2023-24
Subject - Biology
Sample Question Paper – 4

Maximum Marks: 70 **Time: 3 Hours**

General Instructions:

(i) All questions are compulsory.
(ii) The question paper has five sections and 33 questions. All questions are compulsory.
(iii) 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.
(iv) 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.
(v) Wherever necessary, neat and properly labeled diagrams should be drawn.

SECTION – A

1. A decline in population size will be in the simulation
(a) Natality < Mortality
(b) Mortality < Natality
(c) Immigration = Emigration
(d) Emigration < Immigration.

2. Match column I with column II and select the correct option from the given codes.

	Column I		Column II
A.	Chromosomal aberration	(i)	An additional sex chromosome
B.	Down's syndrome	(ii)	Inversion
C.	Klinefelter's syndrome	(iii)	Presence of an extra chromosome
D.	Turner's syndrome	(iv)	Absence of sex chromosome

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

3. Cancer cells do not exhibit the property of
(a) generating tumors
(b) metastasis
(c) contact inhibition
(d) less number of mitochondrial cristae.

4. Mendel's law of independent assortment does not hold true for the genes that are located closely on
(a) same chromosome
(b) non-homologous chromosomes
(c) X-chromosome
(d) autosomes.

5. Percentage of photosynthetically active radiation (PAR) that is captured by plants in synthesis of organic matter is
(a) 50-70%
(b) 30-40%
(c) 80-100%.
(d) 2-10%.

6. Monascus purpureus is a yeast commercially used in the production of
(a) citric acid
(b) ethanol
(c) blood cholesterol lowering statins
(d) streptokinase for removing clots from blood vessels.

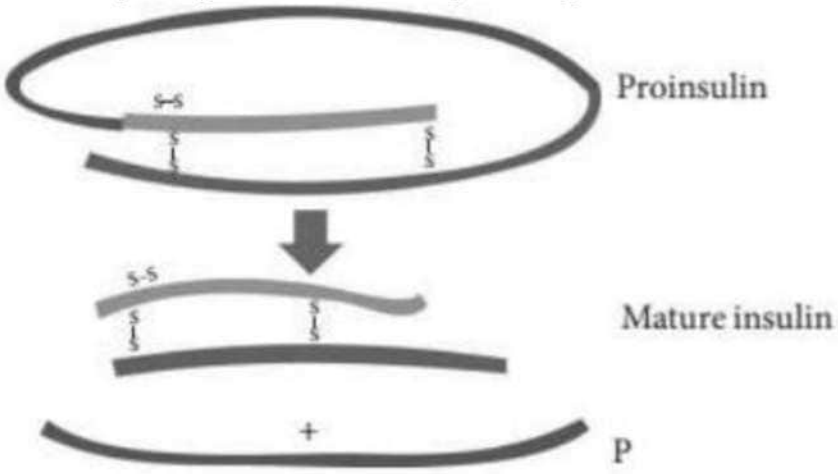
7. Match column I with column II and select the correct option from the given codes.

	Column I		**Column II**
A.	Sporozoites	(i)	Infectious form of *Plasmodium*
B.	Filariasis	(ii)	*Aedes* mosquitoes
C.	Typhoid	(iii)	*Wuchereria*
D.	Chikungunya	(iv)	Widal test

(a) A-(iv), B-(ii), C-(i), D-(iii)
(b) A-(iii), B-(iv), C-(ii), D-(i)

(c) A-(ii), B-(iii), C-(i), D-(iv)
(d) A-(i), B-(iii), C-(iv), D-(ii)

8. Identify the product P in the given figure.



(a) Polypeptide chain A
(b) Polypeptide chain B
(c) Polypeptide chain C
(d) None of these

9. Identify the disease, that can affect both the male and the female genitals.
(a) Cholera
(b) Pneumonia
(c) Gonorrhoea
(d) amoebiasis.

10. What is the criterion for DNA fragments movement on agarose gel during gel electrophoresis?
(a) The smaller the fragment size, the farther it moves.
(b) Positively charged fragments move to farther end.
(c) Negatively charged fragments do not move.
(d) The larger the fragment size, the farther it moves.

11. Population growth-curve is sigmoid, if the growth pattern is
(a) logistic
(b) geometric
(c) exponential
(d) accretionary.

12. Red List contains data or information on
(a) all economically important plants
(b) plants whose products are in international trade
(c) threatened species
(d) marine vertebrates only.

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 and 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: In a terrestrial ecosystem, detritus food chain is the major conduit for energy flow.
Reason: Solar energy is the direct source for energy supply in a detritus food chain.

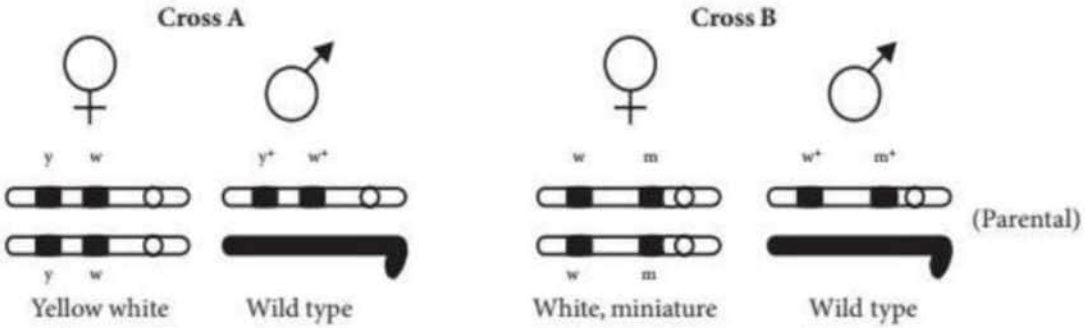
14. Assertion: Although geitonogamy is functionally cross-pollination involving a pollinating agent, genetically it is similar to autogamy.
Reason: In geitonogamy, pollen grains from the anthers of one flower are transferred to the stigma of another flower borne on the same plant.

15. Assertion: The female external genitalia includes mons pubis, labia majora and labia minora.
Reason: The glandular tissue of each breast is divided into 5-10 mammary lobes.

16. Assertion: Hardy-Weinberg principle explains the variations occurring in population and species over a number of generations.
Reason: Hardy-Weinberg principle is applicable in absence of genetic drift and gene flow.

SECTION-B

17. Study the figures given below and answer the question.



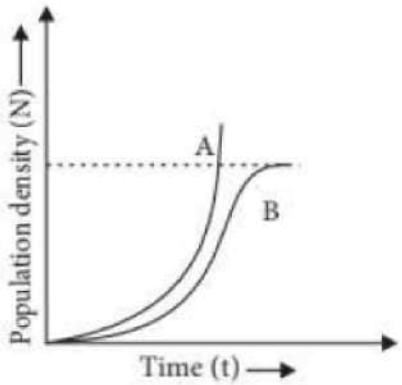
Identify in which of the given crosses, the strength of linkage between the genes is higher. Give reason in support of your answer.

18. List the different parts of the human oviduct through which the ovum travels till it meets the sperm for fertilisation.

19. How is insertional inactivation of an enzyme used as a selectable marker to differentiate recombinants from non-recombinants?

20. Explain, giving two reasons, how immune response by "vaccine" is different from that by "antitoxin injected to humans.

21. Study the graph given below and answer the questions that follow.



(a) Write the status of food and space in the curves A and B.
(b) Time has been shown on X-axis and there is a parallel dotted line above it. Give the significance of this dotted line.

OR

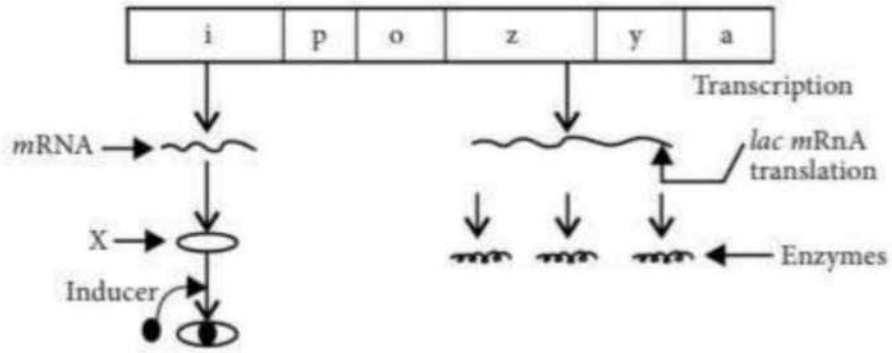
What is mutualism? Explain with an example.

SECTION – C

22. When does the corpus luteum degenerate? Explain the immediate consequences of its degeneration in human female.

23. Describe the development of endosperm in coconut.

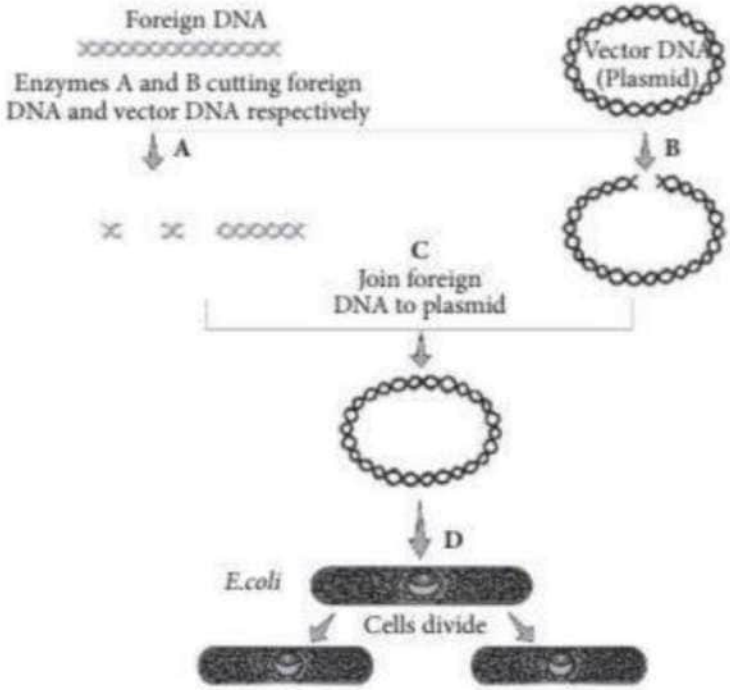
24. Refer to the given figure of lac operon and answer the following questions.



(a) Name the molecule 'X' synthesised by 'i' gene. How does this molecule get inactivated?
(b) Which one of the structural genes codes for B-galactosidase?
(c) When will the transcription of this gene stop?

25. Explain convergent evolution taking one example for plants.

26. (a) The barriers in the innate immunity are given in the following table. Identify A, B, C, and D.



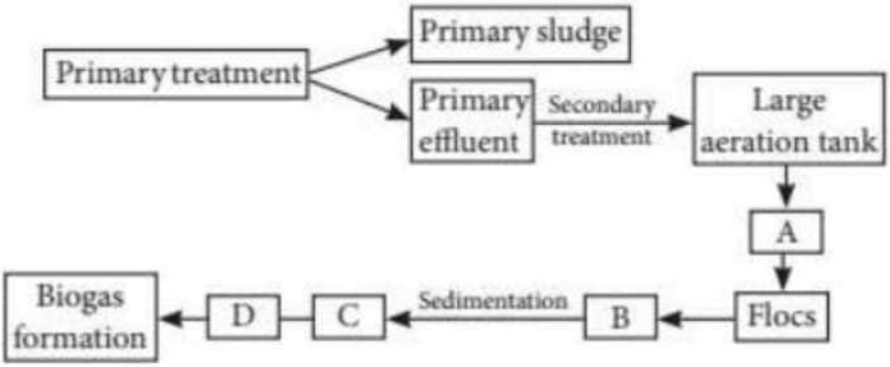
(b) State the role of C in biotechnology.

28. Explain, giving one example, how co-extinction is one of the causes of loss of biodiversity. List the three other causes also (without description).

SECTION-D

Q. No. 29 and 30 are case based questions. Each question has 3 subparts with internal choice in one subpart.

29. Refer to the flow chart given below that shows the sewage treatment.



(a) With reference to the flow chart explain the role of step A in the given process.

OR

Identify A, B, C and D in the given process.
(b) Explain the process at step D.
(c) What is the significance of low B in the given process and how does it forms C?

30. Study the given figure and answer the following questions.
(a) Identify A, B, C and D from the given figure.
(b) What kind of inheritance is shown in the given the figure?
(c) State the significance of this inheritance in the above mentioned cross.

OR

What would happen in the given cross if the parents phenotype be reversed i.e., white eyed female and red eyed male respectively?

SECTION-E

31. (a) Study the following chart. Name the hormones involved at each stage. Explain their functions.

Hypothalamus
↓
Pituitary
↓
Testes
↓
Sperms

(b) Explain with the help of schematic representation the process of formation of mature gamete in a
human female.
(c) How is spermatogenesis different from the process mentioned above? Explain.

OR

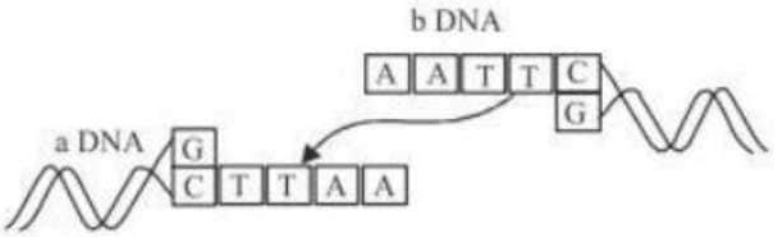
Why is the process of fertilisation in a flowering plant referred to as double fertilisation?

32. During course of evolution why DNA was chosen over RNA as genetic material? Give reasons by first discussing the desired criteria in a molecule that can act as genetic material and in the light of biochemical differences between DNA and RNA.

OR

Refer to the given double stranded DNA molecule.
3 - ATGCATGCATGCATGCATGCATGC-5
5'-TACGTACGTACGTACGTACGTACG-3'
(a) What would be the template DNA strand, coding DNA strand and transcribed mRNA sequence from this strand?
(b) How is mRNA made from DNA? Which enzyme catalyses this reaction?

33. (a) Study the linking of DNA fragments shown.



(i) Name 'a' DNA and 'b' DNA.
(ii) Name the restriction enzyme that recognises this palindrome.
(iii) Name the enzyme that can link these two DNA fragments.
(b) Why has a bacterium to first become 'competent' to be able to take up DNA? Explain how it become 'competent' and takes in the recombinant DNA.

OR

Consider the given base sequence of a certain DNA strand and answer the questions that follow:

G	A	A	T	T	C
C	T	T	A	A	G

(a) Give a short note on 'palindromic sequence' in a DNA. Also state the significance of identify these palindromic nucleotide sequences. enzymes
(b) How the enzyme that recognises the given palindromic nucleotide sequence named so? that

SOLUTIONS

1. (a) Natality and immigration lead to increase in population size whereas mortality and emigration result in population decline.

2. (c)

3. (c): Normal cells have the property of contact inhibition. Due to this property they contact with other cells and inhibit their uncontrolled growth. Cancer cells seem to have lost this property and thus undergo uncontrolled growth.

4. (a): As per linkage experiments carried out by Morgan, the two linked genes do not always segregate independently of each other and F, ratio deviated very significantly from 9:3:3:1 ratio (expected when two genes are independent). Hence, if linkage was known at the time of Mendel, he would not have been able to explain law of independent assortment.

5. (d): About 1-5% of incident solar energy or 2-10% of PAR is captured by the photosynthetic organisms for the synthesis of organic matter (Gross primary productivity).

6. (c) Statins are products of fermentation by yeast Monascus purpureus which resemble mevalovate and are competitive inhibitors of B-hydroxy-B- methylglutaryl or HMG CoA reductase. This inhibits cholesterol synthesis. Statins are, therefore, used in lowering blood cholesterol, e.g., lovastatin, pravastatin, simvastatin.

7. (d)

8. (c) Product P represents polypeptide chain C which is removed prior to insulin formation.

9. (c): Gonorrhoea is a sexually transmitted disease, caused by the bacterium Neisseria gonorrhoeae, that affects the genital mucous membranes of either sex. Symptoms develop about a week after infection and include pain on passing urine and discharge of pus (known as gleet) from the penis (in men) or vagina (in women); some infected women, however, experience no symptoms. If a pregnant woman has gonorrhoea, her baby's eyes may become infected during passage through the birth canal.

10. (a) Gel electrophoresis is a technique used for the separation of substances of different ionic properties. Since the DNA fragments are negatively charged molecules, they can be separated by allowing them to move towards the anode. DNA fragments move towards the anode according to their molecule size through the pores of agarose gel. Thus, the smaller fragments move farther away as compared to larger fragments.

11. (a) Unlimited resources result in exponential growth. In nature, a given habitat has limited resources to support only a certain number of individuals of a population, beyond which no

further growth is possible. This limit is called as nature's carrying capacity (K) for that species in that habitat. Thus, a population growing in a natural habitat with limited resources shows initially a lag phase, followed by phases of increase and decrease and finally the population density reaches the carrying capacity. This type of growth results in sigmoid growth curve and is called logistic growth. Since resources for growth for most animal populations become limiting sooner or later, the logistic growth model is more realistic. It is also called S or sigmoid growth form.

12. (c): A Red Data Book or Red List is a catalogue of taxa facing risk of extinction. Red Data Book or Red List was initiated in 1963

13. (c): There are two types of food chains: grazing food chain and detritus food chain. Detritus food chains are those which start from the dead bodies of animals or fallen leaves etc. In terrestrial ecosystems, detritus food chain is the major conduit of energy flow, while in aquatic ecosystems, grazing food chain is the major conduit of energy flow. As the detritus food chains depend upon the dead organic matter hence, these are not directly dependent upon solar energy.

14. (a) Geitonogamy is a type of pollination in which pollen grains of one flower are transferred to the stigma of another flower belonging to either the same plant or genetically similar plant. It usually occurs in plants which show monoecious condition (unisexual male and female flowers are borne on the same plant). Thus, geitonogamy is functionally cross pollination as it involves the pollinating agent to carry out pollination, but genetically it is similar

to autogamy (self-pollination) since the pollen grains come from the genetically same plant.

15. (c): The female external genitalia include mons pubis, labia majora, labia minora, hymen and clitoris. The mammary glands are paired structures (breasts) that contain glandular tissue and variable amount of fat. The glandular tissue of each breast is divided into 15-20 mammary lobes containing clusters of cells called alveoli.

16. (d): The relative frequencies of various kinds of genes in a large and randomly mating, sexual panmictic population tend to remain constant from generation to generation in the absence of mutation, selection and gene flow. This is called Hardy- Weinberg principle or Hardy-Weinberg equilibrium. Genetic drift can cause elimination of certain alleles or fixation of the other in the population leading to a change in the population of alleles in the gene pool. So, genetic drift must not occur to maintain the equilibrium.

17. In cross A, the strength of linkage between the genes is higher. The distance between the linked genes in the chromosome determines the strength of linkage. The closely located genes show stronger linkage than the distant genes, because the latter are more likely to undergo crossing over than the former.

18. Fimbriae, infundibulum, ampulla and isthmus are the main parts of oviduct, through which ovum travels till it meets the sperm for fertilisation. Finally it reach the ampullary-isthmic junction of oviduct where fertilisation occurs.

19. Insertional inactivation refers to the process where insertion of rDNA within the coding sequence of an enzyme B-galactosidase causes its inactivation. The non-recombinants having intact functional gene, e.g., B galactosidase produce blue colour with chromogenic substrate but when rDNA is inserted chromogenic substrate but when rDNA is inserted within the coding sequence of enzyme ß-galactosidase, recombinants do not produce any colour. Hence recombinants can be easily differentiated from non- recombinants due to insertional inactivation.

20. The immune response by "vaccine" is different from that by "antitoxin" injected to humans due to the following reasons:
(i) Vaccines are antigenic preparation made out of pathogen, which when introduced into body, causes antibody formation against antigen, whereas antitoxins are preformed antibodies which are injected for quick immune response.
(ii) Vaccines provide active immunity whereas antitoxin provide passive immunity. So vaccines provide relief only after long period as they are based on the property of 'memory' of the immune system and generates memory B and T cells that recognises the pathogen quickly whereas antitoxin provide immediate relief.

21. (a) There is ample food and space for the population depicted by the curve A because the resources are unlimited and the curve is exponential. In curve B, there is limited food and space for the population, because the resources are limited and the curve becomes sigmoid.
(b) The dotted line represents the carrying capacity (i.e., represented by 'K') of the environment. The carrying capacity represents the size of population that the environment can hold by providing necessary resources. When a population reaches this line its population size is stabilised by various environmental factors.

OR

Mutualism is an interaction between two organisms of different species where both the partners are benefitted and the association is obligatory. Mycorrhizae are associations between fungi and the roots of higher plants the fungi help the plant in the absorption of essential nutrients from the soil while the plant in turn provides the fungi with energy yielding carbohydrates.

22. In the absence of fertilisation, the corpus luteum degenerates. Degeneration of the corpus luteum leads to decrease in the production of progesterone. As progesterone is needed for the

maintenance of the endometrium, its reduction leads to disintegration of endometrium thus causing menstruation.

23. In Cocos nucifera (coconut), the coconut water represents free-nuclear endosperm and the surrounding kernel represents the cellular endosperm. The primary endos erm nucleus (PEN) first undergoes a number of free nuclear divisions without wall formation to form a large number of free nuclei (free nuclear endosperm). When the fruit is about 50 mm long, the embryo sac gets filled with a clear fluid in which float numerous nuclei of various sizes. At a later stage (about 100 mm long fruit), the suspension shows, in addition to free nuclei, several cells each enclosing a variable number of nuclei. Gradually these cells and free nuclei start settling at the periphery of the cavity, and layers of cellular endosperm start appearing. This forms the coconut meat. The quantity of the cellular endosperm increases further by divisions of the cells.

24. (a) The molecule 'X' is repressor. It gets ninactivated when lactose (inducer) binds with it.
(b) z-gene codes for B-galactosidase.
(c) Transcription of the gene stops when lactose dis absent and thus repressor is free to bind with the operator.

25. Convergent evolution refers to the development of similar adaptive functional structures in unrelated group of organisms. It is also called adaptive convergence. E.g., sweet potato (root modification) and potato (stem modification). Both look alike and perform the same function of food storage but are different in origin.

26. (A) - Physical
B - Lysozyme
C - Interferon
D- Natural killer cells

(b) Sharing of injection needles between two individuals can transmit various diseases like AIDS and hepatitis B, as these diseases are transmitted via blood and semen.

OR

Amoebiasis is caused by Entamoeba histolytica and mainly affects large intestine of human. Elephantiasis is caused by Wuchereria bancrofti and mainly affects lower limbs. Ringworm is caused by Trichophyton and affects skin, hair and nails.

27. (a) In the given figure showing process of recombinant DNA technology, labelled parts A, B, C and D respectively represents restriction endonuclease, restriction endonuclease, DNA ligase and transformation respectively.

(b) DNA ligases (Label C) are also called genetic gum. They join two individual fragments of double stranded DNA by forming phosphodiester bonds between them thus, help in sealing of DNA fragments. Therefore, acts as molecular glue. The enzyme used most often is T4 DNA ligase.

28. Co-extinction means that when a species become extinct, the plant and animal species associated with it in an obligatory relation also become extinct. For example, the case of a co-evolved plant-pollinator mutualism like in Pronuba yuccaselles and Yucca where extinction of one invariably leads to the extinction of the other. The three other causes of biodiversity loss are:
(i) Habitat loss and fragmentation
(ii) Over-exploitation
(iii) Alien species invasion.

29. (a) Step A (mechanical agitation) allows the vigrous growth of useful aerobic microbes into flocs.

OR

A- Mechanical agitation
B - Reduced BOD
C - Activated sludge
D- Anaerobic sludge digesters
(b) At step D, other kinds of bacteria, which grow anaerobically, digest the bacteria and the fungi in the sludge. During this digestion, bacteria produce a mixture of gases such as methane, hydrogen sulphide and carbon dioxide. These gases form biogas and can be used as source of energy as it is inflammable.
(c) The low BOD level indicates that water is less polluted. Once the BOD of sewage or wastewater is reduced significantly, the effluent is then passed into a settling tank where the bacterial 'flocs' are allowed to sediment. This sediment is called activated sludge.

30. (a) The given cross shows Morgan's experiment on Drosophila. 'A' is red eyed carrier female, 'B' is red eyed male, 'C' is Y-chromosome and 'D' is X-chromosome carrying eye colour gene.
(b) Here, the eye colour gene is linked to sex chromosome and is present of X-chromosome showing criss-cross inheritance.
(c) In criss-cross inheritance, the trait is transferred from parent to grand child of same sex through offspring of the opposite sex. A father transmits his traits to his grandson through daughter while a mother transmits the traits to her granddaughter through her son.

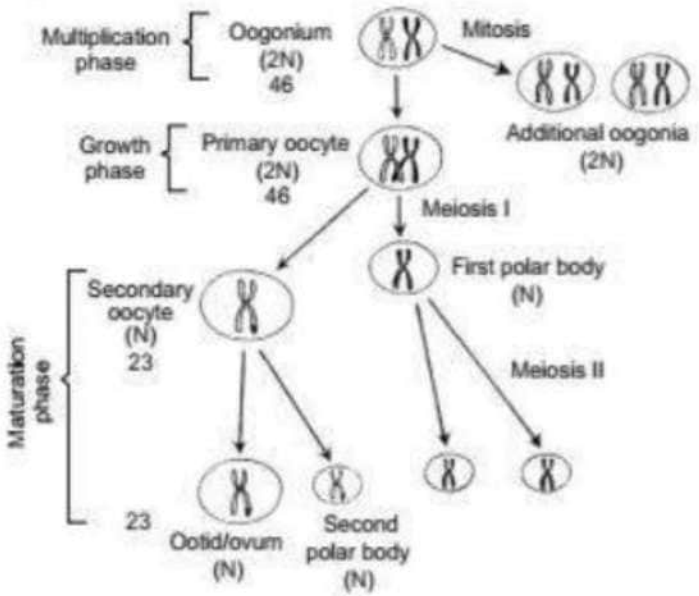
OR

In the given cross, if the parents phenotype will be reversed, i.e., cross between white eyed female and red eyed male then it will result into the red eyed female that are carrier and normal white eyed male.

31.

(a) Hypothalamus
↓ GnRH
Pituitary
↓ LH and FSH
Testes
↓ Testosterone
Sperms

(i) GnRH: Act on pituitary gland and stimulates secretion of LH and FSH.
(ii) LH: Luteinising hormone acts at the Leydig's cells and stimulates synthesis and secretion of androgens.
(iii) FSH: FSH acts on the Sertoli cells and stimulates secretion of some factors which help in the process of spermatogenesis.
(iv) Testosterone (Androgen) stimulates the process of spermatogenesis.
(b) The schematic representation of events of oogenesis is as follows:



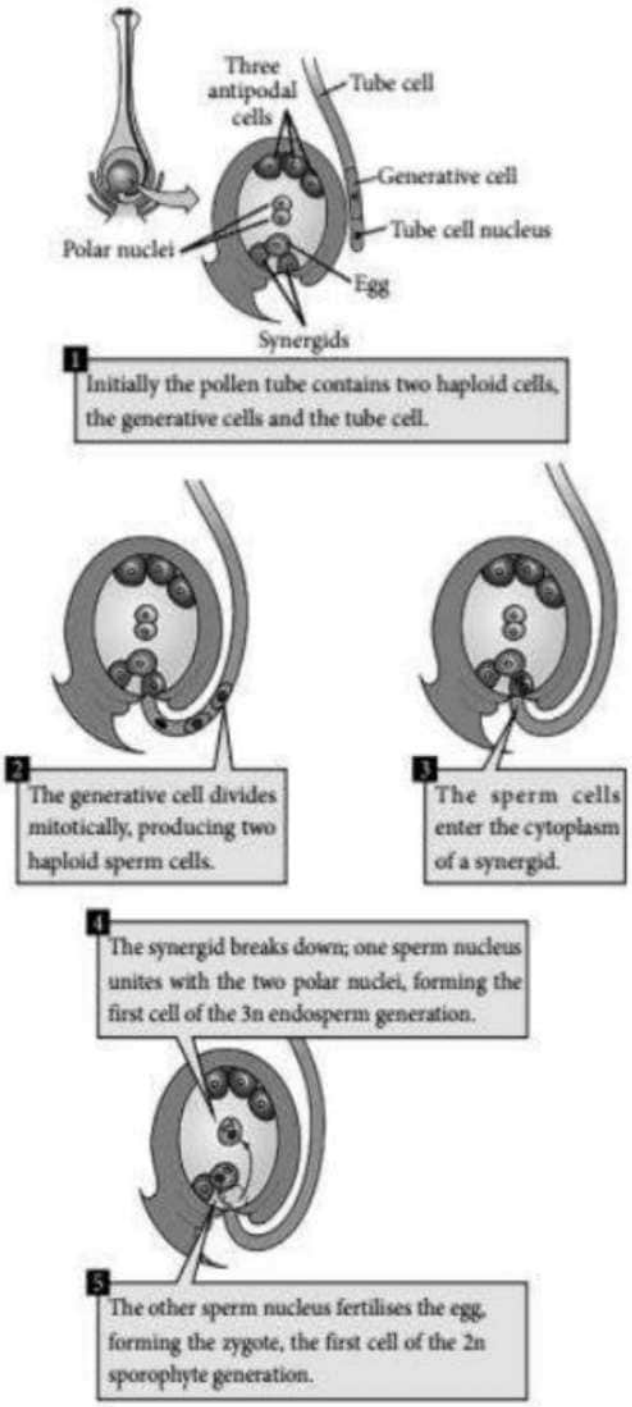
(c) The process of formation of mature gamete in a human female is called oogenesis. The differences between spermatogenesis and oogenesis are as follows:

	Spermatogenesis	Oogenesis
(i)	It occurs in the testes.	It occurs in the ovaries.
(ii)	A primary spermatocyte divide to form two secondary spermatocytes.	A primary oocyte divides to form one secondary oocyte and one polar body.
(iii)	A secondary spermatocyte divides to form two spermatids.	A secondary oocyte divides to form one ootid and one polar body.
(iv)	A spermatogonium forms four spermatozoa.	An oogonium forms one ovum.
(v)	Sperm are minute, yolkless and motile.	Ova are much larger often with yolk and nonmotile.

OR

Double fertilisation is a complex fertilisation mechanism of flowering plants (angiosperms) which involves the fusion of a female gametophyte (megagametophyte, also called the embryo sac) with two male gametes (sperm). It begins when a pollen grain adheres to the stigma of the carpel, (the female reproductive structure of a flower). The pollen grain then takes in moisture and begins to germinate, forming a pollen tube that extends down toward the ovary through the style. The tip of the pollen tube then enters the ovary and penetrates through the micropyle opening in the ovule. The pollen tube proceeds to release the two sperm in the megagametophyte. The cells of an unfertilised ovule are 8 in number and arranged in the form of 3+2+ 3 (from top to bottom), i.e., 3 antipodal cells, 2 polar cells, 2 synergids and 1 egg cell. One sperm fertilises the egg cell and the other sperm combines with
the two polar nuclei of the large central cell of the megagametophyte. The haploid sperm and haploid egg combine to form a diploid zygote,the process being called syngamy, while the other sperm and the two haploid polar nuclei of the large central cell of the megagametophyte form a triploid nucleus (triple fusion). Some plants may form polyploid nuclei. The large cell of the gametophyte will then develop into the endosperm, a nutrient-rich tissue which provides

nourishment to the developing embryo. The ovary, surrounding the ovules, develops into the fruit, which protects the seeds and may function to disperse them. The two central cell maternal nuclei (polar nuclei) that contribute to the endosperm, arise by mitosis from the same single meiotic product that gave rise to the egg. The maternal contribution to the genetic constitution of the triploid endosperm is double that of the embryo. L.S. of ovules showing different stages of fertilisation is as follows:



32. A molecule that can act as a genetic material must fulfill the following criteria:
(i) It should be able to generate its replica (replication).
(ii) It should be stable chemically and structurally.
(iii) It should provide the scope for slow changes (mutation) that are required for evolution.
(iv) It should be able to express itself in the form of 'Mendelian Characters. Though RNA is known to be the genetic material in some viruses and early cells, it is not a very suitable genetic material because
(i) 2'-OH group present in every nucleotide of RNA is a reactive group. It means RNA is highly reactive, labile and easily degradable,
(ii) RNA functions as an enzyme and is, therefore, reactive and unstable, (iii) Uracil present in RNA is less stable as compared to thymine (methyl uracil) of DNA, (iv) Being unstable, RNA mutates at a much faster rate, that is why RNA viruses have shorter life span and mutate and evolve very fast. Such rapid changes are harmful to higher forms of life. DNA is the genetic material of most of the organisms because
- DNA is chemically less reactive and structurally more stable as its nucleotides are not exposed except when they have to express their effect or to be replicated.
- They are comparatively more stable than RNA. Heat which killed bacteria in Griffith's experiment did not destroy their DNAs.
- Presence of thymine in DNA instead of uracil, provides stability to DNA. Hydrogen bonding between purines and pyrimidines and their stacking make DNA more stable for storage of genetic information.
- DNA is capable of undergoing slow mutations required of genetic material.
It has a power of repairing. Since DNA is more stable while RNA is more reactive, both the types of nucleic acids have been retained in genetic expression. DNA which is stable enough not to change with different stages of life cycle, age or with change in metabolism of the organism, is retained as better genetic material for the storage of genetic information. It expresses genetic information by protein synthesis through RNA which is more reactive, exposed for quicker action of protein synthesising machinery and thus is better for the transmission of genetic information.

OR

(a) The two DNA strands have opposite polarity and the DNA-dependent RNA polymerase also catalyse the polymerisation in only one direction, that is,
$5' \rightarrow 3'$, the strand that has the polarity $3' \rightarrow 5'$ acts as a template, and is also referred to as template strand. The other strand which has the polarity
(5'3') and the sequence same as RNA (except thymine at the place of uracil), is displaced during transcription. Strangely, this strand (which does not code for anything) is referred to as coding

strand. All the reference point while defining a transcription unit is made with coding strand. 3 ATGCATGCATGCATGCATGCATGC-5' Template strand
5-TACGTACGTACGTACGTACGTACG-3' Coding strand
5'-UACGUACGUACGUACGUACGUACG-3'-mRNA. (b) mRNA is transcribed from DNA by RNA polymerase. The RNA polymerase separates the two DNA strands, and adds RNA nucleotides in a 5'→ 3' direction, (following a template 3'→ 5'), following the same pairing rules as in DNA, except that a U is paired with A instead of T. As the RNA is made, it is displaced by the DNA strands reannealing and the complete section of RNA is freed from the DNA.

(ii) Restriction enzyme is EcoRI

33. (a) (i) a = Vector DNA; b = Foreign DNA
(iii) DNA ligase.
(b) Competent host is essential for biotechnology experiment. Since DNA is a hydrophilic molecule, it cannot pass through membranes, so the bacterial cells must be made capable to take up DNA i.e., made competent. This can be achieved by:
(i) Treatment of DNA with divalent cation of $CaCl_2$ or rubidium chloride. Treating them with a specific concentration of a divalent cation, increases the efficiency with which DNA enters the bacterium through pores in its cell wall.
(ii) Heat shock treatment of DNA. Recombinant DNA (rDNA) can then be forced into such

cells by incubating the cells with recombinant DNA on ice, followed by placing them briefly at 42°C (heat shock) and then putting them back on ice. This enables the bacteria to take up the recombinant DNA.

OR

(a) The palindromic sequence in DNA is a sequence of base pairs that reads same on the two strands when orientation of reading is kept the same. Each restriction endonucleases recognise a specific palindromic nucleotide sequences in the DNA. Restriction enzymes cut the strand of DNA a little away from the centre of the palindrome sites, but between the same two bases on the opposite strands. This leaves single stranded portions at the ends. These are overhanging stretches called sticky ends on each strand. These are named so because they form hydrogen bonds with their complementary cut counterparts. This stickiness of the ends facilitates the action of the enzyme DNA ligase.
(b) The enzyme that recognises the given palindromic nucleotide sequence is EcoRI. Enzyme EcoRI is named as follows: The capital letter E comes from the genus Escherichia. The letters co are derived from the species name coli. The letter R is from RY13 (strain). The Roman number I indicates that it was the first enzyme isolated from the bacterium E. coli RY13.