

CBSE
Class XII Biology
Sample Paper 5

Time: 3 Hours

Total Marks: 70

General Instructions:

- (i) All questions are compulsory.
 - (ii) The question paper has four sections: Section A, Section B, Section C and Section D. There are 33 questions in the question paper.
 - (iii) Section A 14 questions of 1 mark each and 02 case-based questions. Section B has 9 questions of 2 marks each. Section C has 5 questions of 3 marks each. Section D has 3 questions of 5 marks each.
 - (iv) There is no overall choice in the question paper. However, internal choices are provided in some questions. A student has to attempt only one of the alternatives in such questions.
 - (v) Wherever necessary, neat and properly labelled diagrams should be drawn.
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Section A

1. Name the hormones secreted by human placenta. [1]
2. How endosperm in angiosperms is produced during double fertilization? [1]
3. How does ovum move in the fallopian tube towards the uterus? [1]
4. At what stage of embryonic development, the zona pellucida envelop disintegrates?[1]
5. Why is human female called as homogametic? [1]
6. Which symbols are applied for male and female in pedigree analysis? [1]
7. Three codons on mRNA are not recognised by t-RNA. What are these three codons and what is the general term used for them? [1]
8. Why type II restriction enzymes are used in recombinant DNA technology? [1]
9. What is the function of ADA? [1]
10. Name the interactions in each of the following: [1]
 - i. Ascaris worms living in the intestine of humans.
 - ii. Sucker fish attached to the shark.
11. **Assertion:** Haemophilia shows criss-cross inheritance. [1]
Reason: The gene that causes haemophilia is recessive and lies in the sex (X) chromosome.
 - a. Both assertion and reason are true, and reason is the correct explanation of the assertion.
 - b. Both assertion and reason are true, and reason is not the correct explanation of the assertion.
 - c. Assertion is true but reason is false.
 - d. Both assertion and reason are false.



OR

Assertion: RNA was the first genetic material.

Reason: DNA has evolved from RNA by chemical modifications.

- Both assertion and reason are true, and reason is the correct explanation of the assertion.
- Both assertion and reason are true, and reason is not the correct explanation of the assertion.
- Assertion is true but reason is false.
- Both assertion and reason are false.

12. Assertion: Insulin is an important life-saving drug for diabetic patients. [1]

Reason: It is now possible to produce insulin by using recombinant DNA technology.

- Both assertion and reason are true, and reason is the correct explanation of the assertion.
- Both assertion and reason are true, and reason is not the correct explanation of the assertion.
- Assertion is true but reason is false.
- Both assertion and reason are false.

13. Assertion: Allelopathy is a form of ammensalism that occurs in plants. [1]

Reason: Association of rooting plants with fungal hyphae is an important example of ammensalism.

- Both assertion and reason are true, and reason is the correct explanation of the assertion.
- Both assertion and reason are true, and reason is not the correct explanation of the assertion.
- Assertion is true but reason is false.
- Both assertion and reason are false.

14. Assertion: In in situ conservation, the endangered species are protected in their natural habitat. [1]

Reason: In situ conservation efforts are reflected in biosphere reserves, national parks, and wildlife sanctuaries.

- Both assertion and reason are true, and reason is the correct explanation of the assertion.
- Both assertion and reason are true, and reason is not the correct explanation of the assertion.
- Assertion is true but reason is false.
- Both assertion and reason are false.



15. Read the following and answer any four questions from 15 (i) to 15 (v) given below:

[4]

A wide range of organisms belonging to bacteria, viruses, fungi, protozoans, helminths, etc., could cause diseases in man. Such disease-causing organisms are called pathogens. All parasites are therefore pathogens as they cause harm to the host by living in (or on) them. The pathogens can enter our body by various means, multiply and interfere with normal vital activities, resulting in morphological and functional damage. Pathogens have to adapt to life within the environment of the host. For example, the pathogens that enter the gut must know a way of surviving in the stomach at low pH and resisting the various digestive enzymes.

- (i) Name the pathogenic organism which causes typhoid fever in human beings.
- Salmonella typhi*
 - Plasmodium vivax*
 - Streptococcus pneumoniae*
 - Haemophilus influenzae*
- (ii) Which test is used to confirm the typhoid fever?
- ELISA
 - Widal
 - C-peptide
 - Hb A1c
- (iii) Which of the following disease is caused by Rhino virus in human beings?
- Amoebiasis
 - Ringworm
 - Common cold
 - Malaria
- (iv) The symptoms of which of the following disease include fever, chills, cough and headache?
- Pneumonia
 - Amoebiasis
 - Ringworm
 - Elephantiasis
- (v) **Assertion:** Entamoeba histolytica causes amoebiasis.
Reason: Symptoms of amoebiasis include fever, chills, cough and headache.
- Both assertion and reason are true, and reason is the correct explanation of the assertion.
 - Both assertion and reason are true, and reason is not the correct explanation of the assertion.
 - Assertion is true but reason is false.
 - Both assertion and reason are false.



16. Read the following and answer any four questions from 16 (i) to 16 (v) given below: [4]

Mendel proposed two general rules to consolidate his understanding of inheritance in monohybrid crosses. These are called the Principles or Laws of Inheritance: the First Law or Law of Dominance and the Second Law or Law of Segregation. The law of dominance is used to explain the expression of only one of the parental characters in a monohybrid cross in the F_1 and the expression of both in the F_2 . It also explains the proportion of 3:1 obtained at the F_2 . The Law of Segregation is based on the fact that the alleles do not show any blending and that both the characters are recovered as such in the F_2 generation though one of these is not seen at the F_1 stage. Though the parents contain two alleles during gamete formation, the factors or alleles of a pair segregate from each other such that a gamete receives only one of the two factors. A homozygous parent produces all gametes that are similar while a heterozygous one produces two kinds of gametes each having one allele with equal proportion.

- (i) In a dihybrid cross, pure homozygous plants will be
 - a. 9
 - b. 2
 - c. 1
 - d. 3
- (ii) Mendel observed red flowers in F_1 generation, when he crossed red and white because of
 - a. Dominance
 - b. Recessive gene
 - c. Law of independent assortment
 - d. Law of segregation
- (iii) The blood group containing anti A and anti B is
 - a. Blood group A
 - b. Blood group B
 - c. Blood group AB
 - d. Blood group O
- (iv) A typical genotypic monohybrid ratio is
 - a. 9:3:3:1
 - b. 1:2:1
 - c. 3:1
 - d. 9:7
- (v) Independent assortment of Mendel was proved by
 - a. Monohybrid cross
 - b. Dihybrid cross
 - c. Incomplete dominance
 - d. Back cross



Section B

17. Where are the Leydig cells present? What is their role in reproduction? [2]
18. What are the differences between monohybrid cross and reciprocal cross? [2]
19. Give the full name of the human disease in which the body loses its immunity generally towards infection. Mention any two ways by which this disease is transmitted. [2]
20. What is a gene gun? Give its utility. [2]
- OR**
- What are the uses of biofertilizers?
21. List two options that can be considered for increasing food production. [2]
22. How can transgenic crops harm the environment? [2]
- OR**
- Name the source organism that possesses *Taq* polymerase. What is so special about the function of this enzyme?
23. How do camels show unique adjustments to desert conditions? [2]
24. How do organisms which cannot migrate tend to overcome adverse environmental conditions? Explain taking one example each from vertebrates and angiosperms, respectively. [2]
25. What is predation? Give an example. [2]

Section C

26. Describe the post-fertilisation changes in a flower. [3]
27. In snapdragon, tall (DD) is dominant over dwarf (dd) and red flowers (RR) are incompletely dominant over white flowers (rr), the hybrid being pink flowers. A pure tall white is crossed with a pure dwarf red, and the F₁ is self-fertilised. Give the expected genotype and phenotype in the F₁ and F₂ generations. [3]
28. Give the pathogen, mode of transmission, symptoms and prevention of the disease Amoebiasis. [3]



29.

- (a) Why are transgenic animals so called?
 - (b) With the help of an example, explain the role of transgenic animals in
 - (i) Vaccine safety
 - (ii) Biological products
- [3]

30. Explain three types of interspecific interactions. [3]

Section D

31.

- (a) Draw a well labelled diagram of the structure of the human ovum.
- (b) Which hormone stimulates the ovary to secrete progesterone for maintaining pregnancy?
- (c) What is the function of relaxin hormone? [5]

OR

- (a) Draw a diagram of a mature embryo sac of an angiosperm and label its following parts:
 - (i) Filiform apparatus
 - (ii) Synergids
 - (iii) Central cell
 - (iv) Egg cell
 - (v) Polar nuclei
 - (vi) Antipodals
- (b) Write the fate of the egg cell and polar nuclei after fertilisation.

32. Name the scientists who proved experimentally that DNA is the genetic material. Describe their experiment. [5]

OR

Write the symptoms of haemophilia and sickle cell anaemia in humans. Explain how the inheritance pattern of the two diseases differs from each other.

33. What is biogas? Name the biomass and bacteria involved in the production of biogas. Give the various steps involved in obtaining biogas. [5]

OR

- (i) Name any two diseases caused due to pathogenic microorganisms present in sewage.
- (ii) What is biomagnification?
- (iii) What is the reason for high concentration of DDT in human beings?
- (iv) State two advantages of obtaining biogas from animal dung and biowastes.



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Sample Paper – 5 (Solution)

Time: 3hrs

Total Marks: 70

Section A

1. Placenta acts as an endocrine tissue and produces several hormones like human chorionic gonadotropin (hCG), human placental lactogen (hPL), estrogen and progesterone.
2. During double fertilization, one of the male gametes moves towards the egg cell and fuses with its nucleus to form zygote. This process is called syngamy. The other male gamete moves towards the two polar nuclei located in the central cell and fuses with them to produce a triploid primary endosperm nucleus during triploid fusion.
3. It is due to ciliary movement of the epithelial cells.
4. Blastulation.
5. It produces similar eggs.
6. Square represents to a male and a circle represents to the female.
7. UAA, UAG and UGA. These are termed as termination codons (Non sense codons).
8. Because they can be used in vitro to recognize and cut within specific DNA sequence typically consisting of 4 – 8 nucleotides.
9. It is necessary for the immune system to function.
10.
 - i. Parasitism
 - ii. Commensalism
11. a; In criss-cross inheritance, the transmission of a gene takes place from mother to son or father to daughter. Haemophilia shows criss-cross inheritance as the gene that causes haemophilia is recessive and lies in the sex (X) chromosome. Hence, both assertion and reason are true, and reason is the correct explanation of the assertion.

OR

b; RNA was the first genetic material as there is now enough evidence to suggest that essential life processes (such as metabolism, translation, splicing, etc.), evolved around RNA. RNA used to act as a genetic material as well as a catalyst, it was reactive and hence unstable. Therefore, DNA has evolved from RNA with chemical modifications that make it more stable.
Hence, both assertion and reason are true, and reason is not the correct explanation of the assertion.



12. b; Insulin is an important life-saving drug for diabetic patients as it helps to control the sugar levels in the blood. It is possible to produce human insulin by using recombinant DNA technology. Hence, both assertion and reason are true, and reason is not the correct explanation of the assertion.

13. c; Allelopathy is a phenomenon associated with plants in which one plant produce some chemical substance, which inhibits the growth of other plant species. Ammensalism is the ecological interaction in which an individual species harms another without obtaining benefit. Association of rooting plants with fungal hyphae is an example of mutualism. Hence, assertion is true but reason is false.

14. b; In in situ conservation, the endangered species are protected in their natural habitat so that the entire ecosystem is protected. In situ conservation efforts are reflected in its 14 biosphere reserves, 90 national parks, and more than 450 wildlife sanctuaries and many sacred groves. Hence, both assertion and reason are true, and reason is not the correct explanation of the assertion.

15.

(i) a; *Salmonella typhi* is a pathogenic bacterium which causes typhoid fever in human beings.

(ii) b; Typhoid fever could be confirmed by Widal Test.

(iii) c; Rhino virus cause common cold in human beings.

(iv) a; The symptoms of pneumonia include fever, chills, cough and headache.

(v) c; *Entamoeba histolytica* is a protozoan parasite in the large intestine of human which causes amoebiasis. Symptoms of amoebiasis include constipation, abdominal pain and cramps, stools with excess mucous and blood clots. Hence, assertion is true but reason is false.

16.

(i) b; In a dihybrid cross, there will be 2 homozygous plants.

(ii) a; When two parents are intercrossed with each other, the hybrid produced is the mid-way between two parents.

(iii) d; The blood group containing both antibodies, anti A and anti B forms blood group O.

(iv) b; A typical genotypic monohybrid ratio is 1:2:1.

(v) b; Independent assortment of Mendel was proved by dihybrid cross.



Section B

17. Leydig cells are present outside the seminiferous tubules called interstitial spaces. Leydig cells synthesise and secrete testicular hormones called androgens which control the development of secondary sex organs.

18.

| Monohybrid Cross | Reciprocal Cross |
|--|--|
| It is a cross where two forms of a single trait are hybridised. | It is a second cross involving the same strains but carried by sexes opposite to those in the first cross. |
| It is a one-sided or both sided cross which deals with the transmission of a single trait. | It is both sided cross which deals with the transmission of one, two or more traits. |

19. The full name of the disease is Acquired Immunodeficiency Syndrome (AIDS). This disease is transmitted by contaminated needles and blood transfusion.

20. Gene gun is the new technology where vectorless direct gene transfer occurs in organisms. DNA coated onto microscopic pellets is directly shot into target cells. This technique is used to insert genes which promote tissue repair into cells near wounds, leading to a reduction of healing time.

OR

Uses of biofertilizers:

- i. They are less expensive.
- ii. They do not pollute the environment.

21. Increase in food production can be done by:

- i. Agro-chemical based agriculture.
- ii. Genetically engineered crop-based agriculture.

22. Harms of transgenic crops on the environment:

- i. The transgene may be transferred through pollen from these crops to their wild relatives which may make the weed more persistent and damaging.
- ii. The transgenic crops may themselves become persistent weeds.

OR

Thermus aquaticus (A bacterium) possesses *Taq* polymerase. It is thermostable and can withstand at high temperature (greater than 90°C).



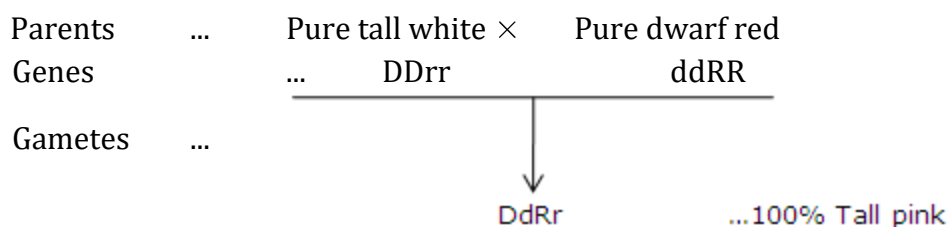
23. The camels show unique adjustments to desert conditions, being very economical in water use, tolerant to wide fluctuations in body temperature and are able to maintain blood stream moisture even during extreme heat stress.
24. Organisms which cannot migrate tend to overcome adverse environmental conditions by developing several methods. For example, some vertebrates escape the stress caused by unfavourable environmental conditions by escaping in time, like bears go into hibernation during the winters. In angiosperms, seeds and some other vegetative reproductive structures serve as means to tide over periods of stress. They reduce their metabolic activity and go into a dormant state. They germinate to form new plants when favourable conditions return.
25. Predation is a temporary interaction between two organisms where one organism captures, kills and eats up the other. The organism which captures and eats up the other organism is called predator and which is eaten is called prey. Example: Tiger (predator) eats goat or deer (prey).

Section C

26. During fertilisation, the pollen tube reaches into the ovule through the micropyle. One of the two gametes joins with the egg cell resulting in the production of a zygote. This is called syngamy and the other with the two polar nuclei producing a triploid primary endosperm nucleus. This is called triple fusion. This completes the process of fertilisation.

After fertilisation, the ovule converts into the seed and the whole ovary develops into a complete fruit. The ovary wall forms the pericarp of the fruit. The integument of the ovule is converted to a seed coat. The egg of the ovule divides mitotically and forms the multicellular diploid embryo.

27.



F₁ generation:

On self-fertilisation: F₁ × F₁

| | | | | |
|---------|-----|----------------|---|----------------|
| Genes | ... | DdRr | × | DdRr |
| Gametes | ... | DR, Dr, dR, dr | × | DR, Dr, dR, dr |

| | DR | Dr | dR | dr |
|-----------|--------------------------|---------------------------|---------------------------|----------------------------|
| DR | DDRR Tall Red | DDRr Tall pink | DdRR Tall red | DdRr Tall pink |
| Dr | DDRr Tall pink | DDrr Tall white | DdRr Tall pink | Ddrr Tall white |
| dR | DdRR Tall red | DdRr Tall pink | Ddrr Dwarf red | ddRr Dwarf pink |
| dr | DdRr Tall pink | Ddrr Tall white | ddRr Dwarf pink | ddrr Dwarf white |

Phenotypic ratio: Tall Red = 3; Tall white = 3;
Tall Pink = 6; Dwarf Red = 1;
Dwarf white = 1; Dwarf Pink = 2.

Genotypic ratio:

DDRR = 1; DdRR = 2; Ddrr = 1; Ddrr = 2;
DDRr = 2; DdRr = 4; ddRR = 1; ddrR = 1;
ddRr = 2

28. Pathogen: *Entamoeba histolytica*

Mode of transmission: It spreads through ingesting contaminated cysts with food and water (faecal or route).

Symptoms:

- (i) Pathogen erodes the mucous membrane of the intestine and produces bleeding ulcers.
- (ii) Stools are accompanied by mucus and blood.

29.

(a) Transgenic animals are so-called because they contain a foreign or a trans gene and have been modified by insertion of recombinant DNA. Positive traits have been inserted in them to produce products which are beneficial to humans.

(b) Role of transgenic animals:

- (i) Vaccine safety: Transgenic animals are predominantly used for testing of vaccines before they are used on human beings. Example: Transgenic mice are used to test the safety of polio vaccine.
- (ii) Biological products: Many human diseases are controlled by biological products. The transgenic animals which produce these products are introduced with DNA which codes for a particular product like human protein (α -I-antitrypsin) for treating emphysema. In 1997, the first transgenic cow Rosie was produced which was capable of secreting human protein-enriched milk. The milk contained human alpha-lactalbumin and was nutritionally a more balanced product for human babies than cow milk.

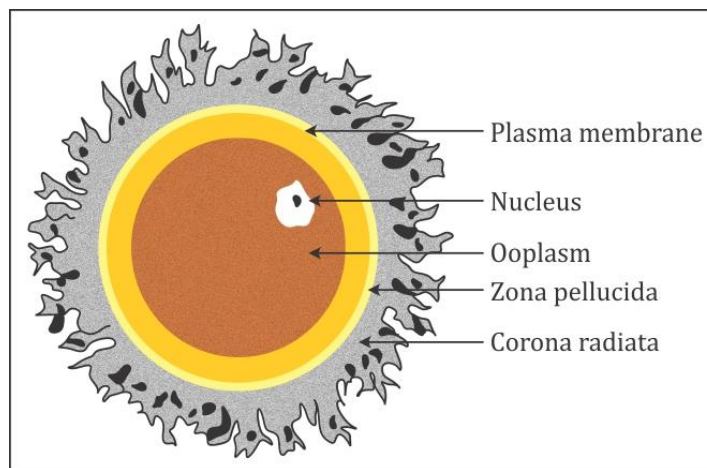


30. Three types of interspecific interactions are

- (i) Competition: It is a type of interaction in which both the species suffer due to limited resources. Example: Carnivorous animals compete for prey
- (ii) Parasitism: It is a type of interaction in which one species is benefitted and the other species is harmed. Example: Malarial parasite inside the female Anopheles mosquito causes malaria in humans.
- (iii) Mutualism: In this type of interaction, both the species are benefitted. Example: The sea anemone and hermit crab stay in mutual relationship with each other.

Section D

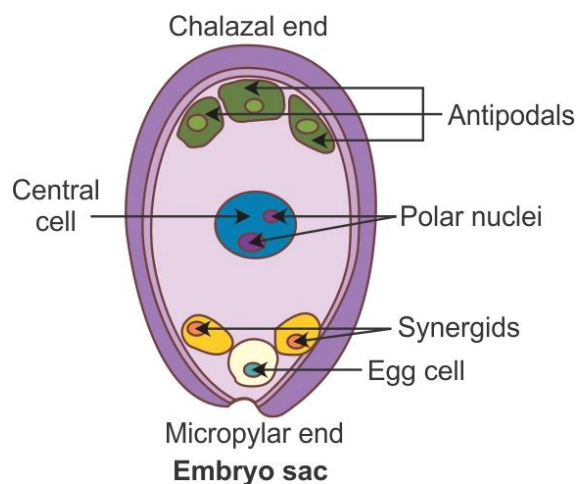
31. (a) Structure of human ovum:



- (b)** Human chorionic gonadotropin (HCG) stimulates the ovary to secrete progesterone for maintaining pregnancy.
- (c)** Relaxin helps to soften ligaments that hold pubic symphysis together and relaxes the cervix of the uterus for easy delivery of baby.

OR

a. Mature embryo sac of an angiosperm



- b. The filiform apparatus present at the micropylar end of the synergids guides the entry of pollen tubes which carries two male gametes. Of the two gametes, one fuses with the egg cell to form a zygote and the other gamete fuses with two polar nuclei to form the primary endosperm nucleus. This is called triple fusion and such type of fertilisation is called double fertilisation.

32. Proof for DNA as genetic material came from the experiments of Alfred Hershey and Martha Chase (1952), who worked with bacteriophages.

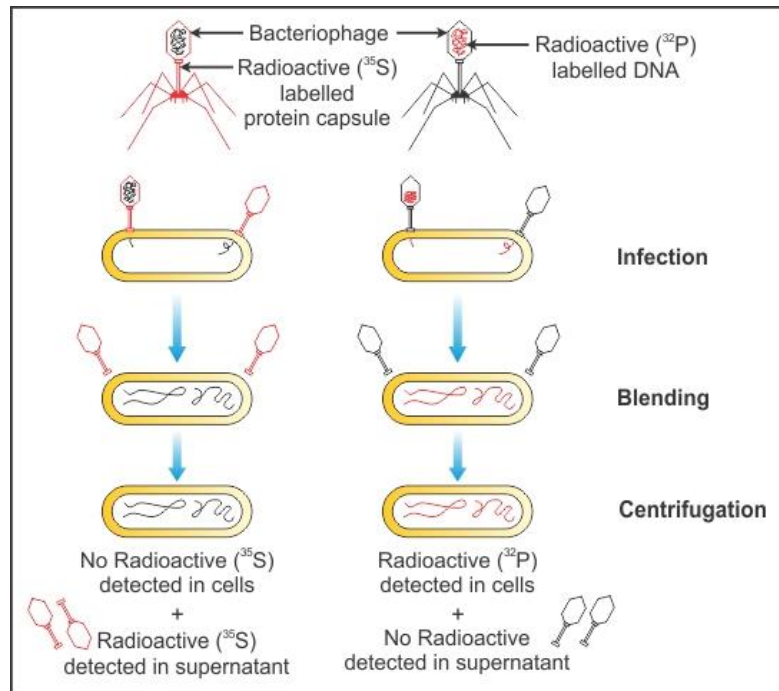
On infection, the bacteriophage injects only the DNA into the bacterial cell and not the protein coat. The bacterial cell treats the viral DNA as its own and subsequently manufactures more virus particles. They made two different preparations of the phage. In one, the DNA was made radioactive with ^{32}P . In the other, the protein coat was made radioactive with ^{35}S .

These two phage preparations were allowed to infect bacterial cells separately. Soon after infection, the cultures were gently agitated in a blender to separate the adhering protein coats of the virus from the bacterial cells.

The culture was also centrifuged to separate the viral coat and the bacterial cells.

When the phage containing radioactive DNA was used to infect the bacteria, its radioactivity was found in the bacterial cells (in the sediment) indicating that the DNA has been injected into the bacterial cell.

So, DNA and not proteins is the genetic material.



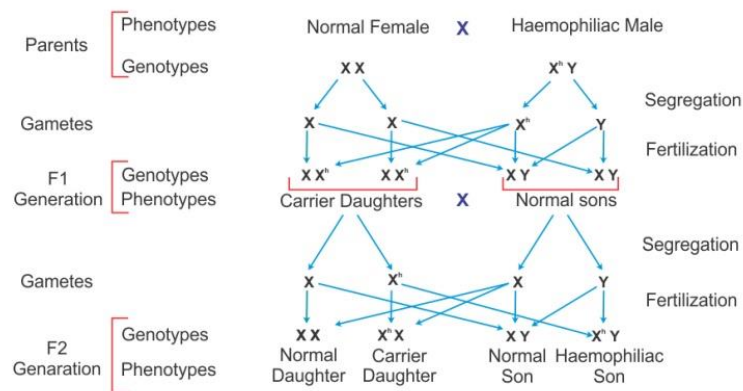
OR

Symptoms of haemophilia: Haemophilia is also called bleeder's disease in which a single cut leads to non-stop bleeding. It prevents clotting of blood. A seriously affected person may bleed to death after even a minor skin cut.

Symptoms of sickle cell anaemia: In this disease, red blood cells become elongated and curved under low oxygen tension. Individuals with this disease suffer attacks because of aggregation of red blood cells. These erythrocytes are destroyed more rapidly than the normal red blood cells leading to anaemia.

Inheritance pattern of haemophilia:

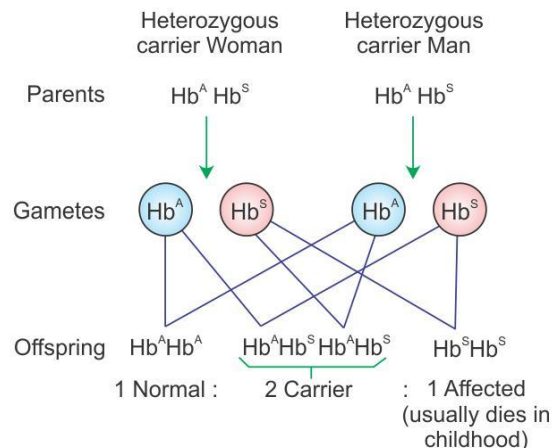
Haemophilia is a sex-linked recessive disease which shows its transmission from unaffected carrier female to some of the male progeny. It shows criss-cross inheritance. The heterozygous female (carrier) for haemophilia may transmit the disease to the sons. The possibility of a female becoming a haemophilic is extremely rare because the mother of such a female has to be at least a carrier and the father should be haemophilic.



Inheritance pattern of sickle cell anaemia:

Sickle cell anaemia is an autosomal hereditary disease which can be transmitted from parents to offspring when both partners are carrier for the gene (heterozygous).

It is controlled by a single pair of allele Hb^A and Hb^S . Of the three possible genotypes $Hb^A Hb^A$, $Hb^A Hb^S$ and $Hb^S Hb^S$, only the last one shows the diseased phenotype. Heterozygous ($Hb^A Hb^S$) individuals appear apparently unaffected, but they are carrier of the disease as there is 50% probability of transmission of the mutant gene to the progeny, thus exhibiting the sickle cell trait.



33. Biogas is the mixture of gases produced during decay of biomass in the absence of oxygen.

The biomass used in the production of biogas is animal dung, sewage, crop residues, vegetable wastes, water hyacinth, poultry droppings and wastes from agro-based industries. Methanogens are involved in the production of biogas.

Steps involved in obtaining biogas:

- (i) Slurry of animal dung is fed into the digester.
- (ii) In the digester, microbes break down or decompose the complex compounds of the biomass in the slurry.
- (iii) The anaerobic microbes do not require oxygen, so the digesters are designed like a sealed chamber.
- (iv) The process takes a few days and gases like methane, CO₂, hydrogen and hydrogen sulphide are produced.

OR

- (i) Dysentery, typhoid, jaundice and cholera.
- (ii) Biomagnification refers to increase in concentration of the toxicant at successive trophic levels.
- (iii) DDT is a non-biodegradable insecticide which, through agricultural run off, reaches water bodies and enters the food chains. During this process, the concentration of DDT goes on increasing at each trophic level. The fishes are finally consumed by man, raising DDT concentration in human beings.
- (iv) Advantages of obtaining biogas from animal dung and biowastes:
 - a. It is used for the production of electricity.
 - b. It is an excellent fuel which burns without producing smoke.

