CBSE
Class XII Biology
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 $90^{o}C$).

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.

Parents ... Pure tall white × Pure dwarf red

Genes ... DDrr ddRR

Gametes ...

↓

DdRr ...100% Tall pink

F_1 generation:

On self-fertilisation: $F_1 \times F_1$

Genes ... DdRr × DdRr

Gametes ... DR, Dr, dR, dr × DR, Dr, dR, dr

	DR	**Dr**	**dR**	**dr**
DR	**DDDRR** 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

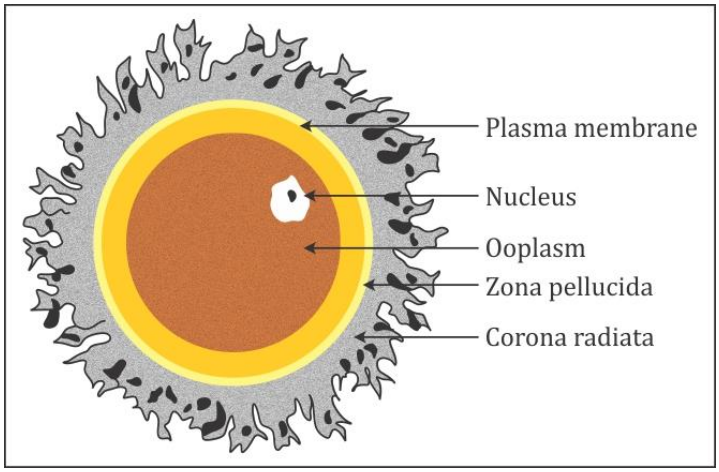
(i) Competition: It is a type of interaction in which both the species suffer due to limited resources. Example: Carnivorous animals compete for prey

(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:

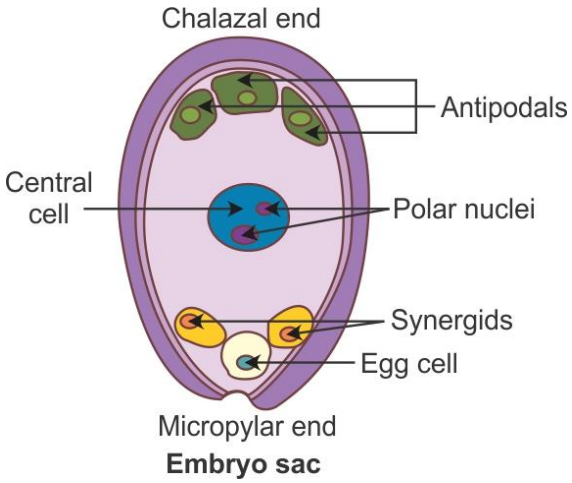


(b) Human chorionic gonadotropin (HCG) stimulates the ovary to secrete progesterone for maintaining pregnancy.

(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



Embryo sac

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.

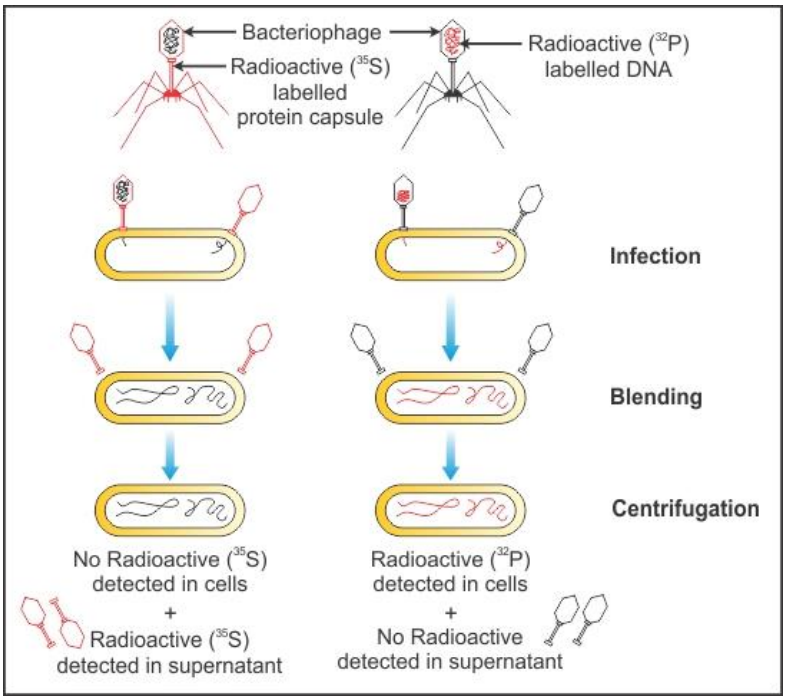
On infection, the bacteriophage injects only the DNA into the bacterial cell and not the protein coat. The bacterial cell treats the viral DNA as its own and subsequently manufactures more virus particles. They made two different preparations of the phage. In one, the DNA was made radioactive with ^{32}P.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



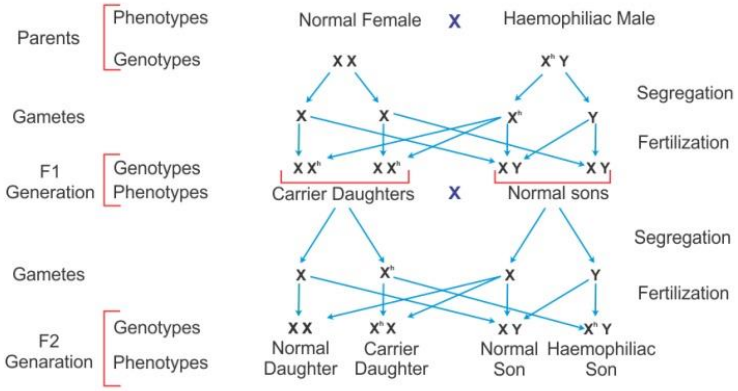
OR

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:

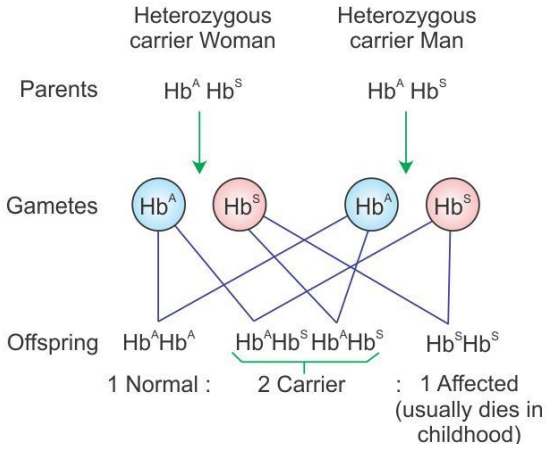
Haemophilia is a sex-linked recessive disease which shows its transmission from unaffected carrier female to some of the male progeny. It shows criss-cross inheritance. The heterozygous female (carrier) for haemophilia may transmit the disease to the sons. The possibility of a female becoming a haemophilic 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, CO_2, 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.