

NCERT Solutions for Class 12 Biology Chapter 2

Sexual Reproduction in Flowering Plants Class 12

Chapter 2 Sexual Reproduction in Flowering Plants Exercise Solutions

Exercise : Solutions of Questions on Page Number : 40

Q1 :

Name the parts of an angiosperm flower in which development of male and female gametophyte take place.

Answer :

The male gametophyte or the pollen grain develops inside the pollen chamber of the anther, whereas the female gametophyte (also known as the embryo sac) develops inside the nucellus of the ovule from the functional megaspore.

Q2 :

Differentiate between microsporogenesis and megasporogenesis. Which type of cell division occurs during these events? Name the structures formed at the end of these two events.

Answer :

(a)

Microsporogenesis		Megasporogenesis
1.	It is the process of the formation of microspore tetrads from a microspore mother cell through meiosis.	It is the process of the formation of the four megaspores from a megaspore mother cell in the region of the nucellus through meiosis
2.	It occurs inside the pollen sac of the anther.	It occurs inside the ovule.

(b) Both events (microsporogenesis and megasporogenesis) involve the process of meiosis or reduction division which results in the formation of haploid gametes from the microspore and megaspore mother cells.

(c) Microsporogenesis results in the formation of haploid microspores from a diploid microspore mother cell. On the other hand, megasporogenesis results in the formation of haploid megaspores from a diploid megaspore mother cell.

Q3 :

Arrange the following terms in the correct developmental sequence:

Pollen grain, sporogenous tissue, microspore tetrad, pollen mother cell, male gametes

Answer :

The correct development sequence is as follows:

Sporogenous tissue - pollen mother cell - microspore tetrad - Pollen grain - male gamete

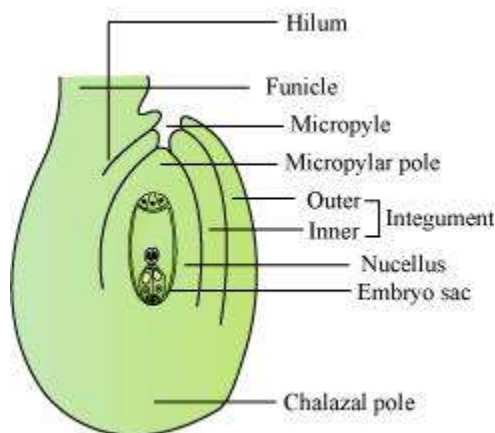
During the development of microsporangium, each cell of the sporogenous tissue acts as a pollen mother cell and gives rise to a microspore tetrad, containing four haploid microspores by the process of meiosis (microsporogenesis). As the anther matures, these microspores dissociate and develop into pollen grains. The pollen grains mature and give rise to male gametes.

Q4 :

With a neat, labelled diagram, describe the parts of a typical angiosperm ovule.

Answer :

An ovule is a female megasporangium where the formation of megaspores takes place.



The various parts of an ovule are -

- (1) Funiculus - It is a stalk-like structure which represents the point of attachment of the ovule to the placenta of the ovary.
- (2) Hilum - It is the point where the body of the ovule is attached to the funiculus.
- (3) Integuments - They are the outer layers surrounding the ovule that provide protection to the developing embryo.
- (4) Micropyle - It is a narrow pore formed by the projection of integuments. It marks the point where the pollen tube enters the ovule at the time of fertilization.
- (5) Nucellus - It is a mass of the parenchymatous tissue surrounded by the integuments from the outside. The nucellus provides nutrition to the developing embryo. The embryo sac is located inside the nucellus.
- (6) Chalazal - It is the based swollen part of the nucellus from where the integuments originate.

Q5 :

What is meant by monosporic development of female gametophyte?

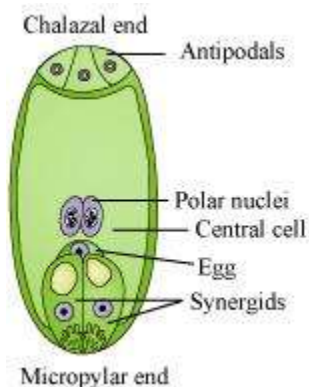
Answer :

The female gametophyte or the embryo sac develops from a single functional megaspore. This is known as monosporic development of the female gametophyte. In most flowering plants, a single megaspore mother cell present at the micropylar pole of the nucellus region of the ovule undergoes meiosis to produce four haploid megaspores. Later, out of these four megaspores, only one functional megaspore develops into the female gametophyte, while the remaining three degenerate.

Q6 :

With a neat diagram explain the 7-celled, 8-nucleate nature of the female gametophyte.

Answer :



The female gametophyte (embryo sac) develops from a single functional megaspore. This megaspore undergoes three successive mitotic divisions to form eight nucleate embryo sacs.

The first mitotic division in the megaspore forms two nuclei. One nucleus moves towards the micropylar end while the other nucleus moves towards the chalazal end. Then, these nuclei divide at their respective ends and re-divide to form eight nucleate stages. As a result, there are four nuclei each at both the ends i.e., at the micropylar and the chalazal end in the embryo sac. At the micropylar end, out of the four nuclei only three differentiate into two synergids and one egg cell. Together they are known as the egg apparatus. Similarly, at the chalazal end, three out of four nuclei differentiate as antipodal cells. The remaining two cells (of the micropylar and the chalazal end) move towards the centre and are known as the polar nuclei, which are situated in a large central cell. Hence, at maturity, the female gametophyte appears as a 7-celled structure, though it has 8 nucleate.

Q7 :

What are chasmogamous flowers? Can cross-pollination occur in cleistogamous flowers? Give reasons for your answer.

Answer :

There are two types of flowers present in plants namely *Oxalis* and *Viola* - chasmogamous and cleistogamous flowers. Chasmogamous flowers have exposed anthers and stigmata similar to the flowers of other species.

Cross-pollination cannot occur in cleistogamous flowers. This is because cleistogamous flowers never open at all. Also, the anther and the stigma lie close to each other in these flowers. Hence, only self-pollination is possible in these flowers.

Q8 :

Mention two strategies evolved to prevent self-pollination in flowers.

Answer :

Self-pollination involves the transfer of pollen from the stamen to the pistil of the same flower. Two strategies that have evolved to prevent self-pollination in flowers are as follows:

(1) In certain plants, the stigma of the flower has the capability to prevent the germination of pollen grains and hence, prevent the growth of the pollen tube. It is a genetic mechanism to prevent self-pollination called **self-incompatibility**. Incompatibility may be between individuals of the same species or between individuals of different species. Thus, incompatibility prevents breeding.

(2) In some plants, the gynoecium matures before the androecium or vice-versa. This phenomenon is known as **protogyny** or **protandry** respectively. This prevents the pollen from coming in contact with the stigma of the same flower.

Q9 :

What is self-incompatibility? Why does self-pollination not lead to seed formation in self-incompatible species?

Answer :

Self-incompatibility is a genetic mechanism in angiosperms that prevents self-pollination. It develops genetic incompatibility between individuals of the same species or between individuals of different species.

The plants which exhibit this phenomenon have the ability to prevent germination of pollen grains and thus, prevent the growth of the pollen tube on the stigma of the flower. This prevents the fusion of the gametes along with the development of the embryo. As a result, no seed formation takes place.

Q10 :

What is bagging technique? How is it useful in a plant breeding programme?

Answer :

Various artificial hybridization techniques (under various crop improvement programmes) involve the removal of the anther from bisexual flowers without affecting the female reproductive part (pistil) through the process of emasculation. Then, these emasculated flowers are wrapped in bags to prevent pollination by unwanted pollen grains. This process is called bagging.

This technique is an important part of the plant breeding programme as it ensures that pollen grains of only desirable plants are used for fertilization of the stigma to develop the desired plant variety.

Q11 :

What is triple fusion? Where and how does it take place? Name the nuclei involved in triple fusion.

Answer :

Triple fusion is the fusion of the male gamete with two polar nuclei inside the embryo sac of the angiosperm.

This process of fusion takes place inside the embryo sac.

When pollen grains fall on the stigma, they germinate and give rise to the pollen tube that passes through the style and enters into the ovule. After this, the pollen tube enters one of synergids and releases two male gametes there. Out of the two male gametes, one gamete fuses with the nucleus of the egg cell and forms the zygote (syngamy). The other male gamete fuses with the two polar nuclei present in the central cell to form a triploid primary endosperm nucleus. Since this process involves the fusion of three haploid nuclei, it is known as triple fusion. It results in the formation of the endosperm.

One male gamete nucleus and two polar nuclei are involved in this process.

Q12 :

Why do you think the zygote is dormant for sometime in a fertilized ovule?

Answer :

The zygote is formed by the fusion of the male gamete with the nucleus of the egg cell. The zygote remains dormant for some time and waits for the endosperm to form, which develops from the primary endosperm cell resulting from triple fusion. The endosperm provides food for the growing embryo and after the formation of the endosperm, further development of the embryo from the zygote starts.

Q13 :

Differentiate between:

- (a) Hypocotyl and epicotyl;**
- (b) Coleoptile and coleorrhiza;**
- (c) Integument and testa;**
- (d) Perisperm and pericarp.**

Answer :

Differentiate between

(a)

Hypocotyl		Epicotyl
1.	The portion of the embryonal axis which lies below the cotyledon in a dicot embryo is known as the hypocotyl.	The portion of the embryonal axis which lies above the cotyledon in a dicot embryo is known as the epicotyl.
2.	It terminates with the radicle.	It terminates with the plumule.

(b)

Coleoptile	Coleorrhiza
It is a conical protective sheath that encloses the plumule in a monocot seed.	It is an undifferentiated sheath that encloses the radicle and the root cap in a monocot seed.

(c)

Integument	Testa
It is the outermost covering of an ovule. It provides protection to it.	It is the outermost covering of a seed.

(d)

Perisperm	Pericarp
It is the residual nucellus which persists. It is present in some seeds such as beet and black pepper.	It is the ripened wall of a fruit, which develops from the wall of an ovary.

Q14 :

Why is apple called a false fruit? Which part(s) of the flower forms the fruit?

Answer :

Fruits derived from the ovary and other accessory floral parts are called false fruits. On the contrary, true fruits are those fruits which develop from the ovary, but do not consist of the thalamus or any other floral part. In an apple, the fleshy receptacle forms the main edible part. Hence, it is a false fruit.

Q15 :

What is meant by emasculation? When and why does a plant breeder employ this technique?

Answer :

Emasculation is the process of removing anthers from bisexual flowers without affecting the female reproductive part (pistil), which is used in various plant hybridization techniques.

Emasculation is performed by plant breeders in bisexual flowers to obtain the desired variety of a plant by crossing a particular plant with the desired pollen grain. To remove the anthers, the flowers are covered with a bag before they open. This ensures that the flower is pollinated by pollen grains obtained from desirable varieties only. Later, the mature, viable, and stored pollen grains are dusted on the bagged stigma by breeders to allow artificial pollination to take place and obtain the desired plant variety.

Q16 :

If one can induce parthenocarpy through the application of growth substances, which fruits would you select to induce parthenocarpy and why?

Answer :

Parthenocarpy is the process of developing fruits without involving the process of fertilization or seed formation. Therefore, the seedless varieties of economically important fruits such as orange, lemon, water melon etc. are produced using this technique. This technique involves inducing fruit formation by the application of plant growth hormones such as auxins.

Q17 :

Explain the role of tapetum in the formation pollen-grain wall.

Answer :

Tapetum is the innermost layer of the microsporangium. It provides nourishment to the developing pollen grains. During microsporogenesis, the cells of tapetum produce various enzymes, hormones, amino acids, and other nutritious material required for the development of pollen grains. It also produces the exine layer of the pollen grains, which is composed of the sporopollenin.

Q18 :

What is apomixis and what is its importance?

Answer :

Apomixis is the mechanism of seed production without involving the process of meiosis and syngamy. It plays an important role in hybrid seed production. The method of producing hybrid seeds by cultivation is very expensive for farmers. Also, by sowing hybrid seeds, it is difficult to maintain hybrid characters as characters segregate during meiosis. Apomixis prevents the loss of specific characters in the hybrid. Also, it is a cost-effective method for producing seeds.

NCERT Solutions for Class 12 Biology Chapter 4

Reproductive Health Class 12

Chapter 4 Reproductive Health Exercise Solutions

Exercise : Solutions of Questions on Page Number : 66

Q1 :

What do you think is the significance of reproductive health in a society?

Answer :

Reproductive health is the total well being in all aspects of reproduction. It includes physical, emotional, behavioural, and social well being. Sexually transmitted diseases such as AIDS, gonorrhoea, etc. are transferred from one individual to another through sexual contact. It can also lead to unwanted pregnancies. Hence, it is necessary to create awareness among people, especially the youth, regarding various reproduction related aspects as the young individuals are the future of the country and they are most susceptible of acquiring sexually transmitted diseases. Creating awareness about the available birth control methods, sexually transmitted diseases and their preventive measures, and gender equality will help in bringing up a socially conscious healthy family. Spreading awareness regarding uncontrolled population growth and social evils among young individuals will help in building up a reproductively healthy society.

Q2 :

Suggest the aspects of reproductive health which need to be given special attention in the present scenario.

Answer :

Reproductive health is the total well being in all aspects of reproduction. The aspects which have to be given special attention in the present scenarios are

(1) Counselling and creating awareness among people, especially the youth, about various aspects of reproductive health, such as sexually transmitted diseases, available contraceptive methods, case of pregnant mothers, adolescence, etc.

(2) Providing support and facilities such as medical assistance to people during pregnancy, STDs, abortions, contraceptives, infertility, etc. for building a reproductively healthy society

Q3 :

Is sex education necessary in schools? Why?

Answer :

Yes, introduction of sex education in schools is necessary. It would provide right information to young individuals at the right time about various aspects of reproductive health such as reproductive organs, puberty, and adolescence related changes, safe sexual practices, sexually transmitted diseases, etc.

The young individual or adolescents are more susceptible in acquiring various sexually transmitted diseases. Hence, providing information to them at the right time would help them to lead a reproductively healthy life and also protect them from the myths and misconceptions about various sex related issues.

Q4 :

Do you think that reproductive health in our country has improved in the past 50 years? If yes, mention some such areas of improvement.

Answer :

Yes, the reproductive health has tremendously improved in India in the last 50 years. The areas of improvement are as follows.

- (1) Massive child immunization programme, which has lead to a decrease in the infant mortality rate
- (2) Maternal and infant mortality rate, which has been decreased drastically due to better post natal care
- (3) Family planning, which has motivated people to have smaller families
- (4) Use of contraceptive, which has resulted in a decrease in the rate of sexually transmitted diseases and unwanted pregnancies

Q5 :

What are the suggested reasons for population explosion?

Answer :

The human population is increasing day by day, leading to population explosion. It is because of the following two major reasons.

- (a) Decreased death rate
- (b) Increased birth rate and longevity

The death rate has decreased in the past 50 years. The factor leading to decreased death rate and increased birth rate are control of diseases, awareness and spread of education, improvement in medical facilities, ensured food supply in emergency situation, etc. All this has also resulted in an increase in the longevity of an individual.

Q6 :

Is the use of contraceptives justified? Give reasons.

Answer :

Yes, the use of contraceptives is absolutely justified. The human population is increasing tremendously. Therefore, to regulate the population growth by regulating reproduction has become a necessary demand in the present times. Various contraceptive devices have been devised to reduce unwanted pregnancies, which help in bringing down the increased birth rate and hence, in checking population explosion.

Q7 :

Removal of gonads cannot be considered as a contraceptive option. Why?

Answer :

Contraceptive devices are used to prevent unwanted pregnancy and to prevent the spreading of STDs. There are many methods, such as natural, barrier, oral, and surgical methods, that prevent unwanted pregnancy. However, the complete removal of gonads cannot be a contraceptive option because it will lead to infertility and unavailability of certain hormones that are required for normal functioning of accessory reproductive parts. Therefore, only those contraceptive methods can be used that prevent the chances of fertilization rather than making the person infertile forever.

Q8 :

Amniocentesis for sex determination is banned in our country. Is this ban necessary? Comment.

Answer :

Amniocentesis is a pre-natal diagnostic technique that is used to determine the sex and metabolic disorders of the developing foetus in the mother's uterus through the observation of the chromosomal patterns. This method was developed so as to determine any kind of genetic disorder present in the foetus. However, unfortunately, this technique is being misused to detect the sex of the child before birth and the female foetus is then aborted. Thus, to prevent the increasing female foeticides, it is necessary to ban the usage of amniocentesis technique for determining the sex of a child.

Q9 :

Suggest some methods to assist infertile couples to have children.

Answer :

Infertility is the inability of a couple to produce a baby even after unprotected intercourse. It might be due to abnormalities present in either male or female, or might be even both the partners. The techniques used to assist infertile couples to have children are as follows.

(a) Test tube babies

This involves in-vitro fertilization where the sperms meet the egg outside the body of a female. The zygote, hence produced, is then transferred in the uterus or fallopian tube of a normal female. The babies produced from this method are known as test tube babies.

(b) Gamete Intra fallopian transfer (GIFT)

It is a technique that involves the transfer of gamete (ovum) from a donor into the fallopian tube of the recipient female who is unable to produce eggs, but has the ability to conceive and can provide right conditions for the development of an embryo.

(c) Intra Cytoplasmic sperm injection (ICSI)

It is a method of injecting sperm directly into the ovum to form an embryo in laboratory.

(d) Artificial insemination

Artificial insemination is a method of transferring semen (sperm) from a healthy male donor into the vagina or uterus of the recipient female. It is employed when the male partner is not able to inseminate the female or has low sperm counts.

Q10 :

What are the measures one has to take to prevent from contracting STDs?

Answer :

Sexually transmitted diseases (STDs) get transferred from one individual to the other through sexual contact. Adolescents and young adults are at the greatest risk of acquiring these sexually transmitted diseases. Hence, creating awareness among the adolescents regarding its after-effects can prevent them from contracting STDs. The use of contraceptives, such as condoms, etc. while intercourse, can prevent the transfer of these diseases. Also, sex with unknown partners or multiple partners should be avoided as they may have such diseases. Specialists should be consulted immediately in case of doubt so as to assure early detection and cure of the disease.

Q11 :

State True/False with explanation

(a) Abortions could happen spontaneously too. (True/False)

(b) Infertility is defined as the inability to produce a viable offspring and is always due to abnormalities/defects in the female partner. (True/False)

(c) Complete lactation could help as a natural method of contraception. (True/False)

(d) Creating awareness about sex related aspects is an effective method to improve reproductive health of the people. (True/False)

Answer :

(a) Abortions could happen spontaneously too.

True

(b) Infertility is defined as the inability to produce a viable offspring and is always due to abnormalities/defects in the female partner.

False

Infertility is defined as the inability of the couple to produce baby even after unprotected coitus. It might occur due to abnormalities/defects in either male or female or both.

(c) Complete lactation could help as a natural method of contraception.

False

Complete lactation or lactational amenorrhea is a natural method of contraception. However, it is limited till lactation period, which continues till six months after parturition.

(d) Creating awareness about sex related aspects is an effective method to improve reproductive health of the people.

True

Q12 :

Correct the following statements:

(a) Surgical methods of contraception prevent gamete formation.

(b) All sexually transmitted diseases are completely curable.

(c) Oral pills are very popular contraceptives among the rural women.

(d) In E. T. techniques, embryos are always transferred into the uterus.

Answer :

(a) Surgical methods of contraception prevent gamete formation.

Correction

Surgical methods of contraception prevent the flow of gamete during intercourse.

(b) All sexually transmitted diseases are completely curable.

Correction

Some of the sexually transmitted diseases are curable if they are detected early and treated properly. AIDS is still an incurable disease.

(c) Oral pills are very popular contraceptives among the rural women.

Correction

Oral pills are very popular contraceptives among urban women.

(d) In E. T. techniques, embryos are always transferred into the uterus.

Correction

In embryo transfer technique, 8 celled embryos are transferred into the fallopian tube while more than 8 celled embryos are transferred into the uterus.

NCERT Solutions for Class 12 Biology Chapter 5

Principles of Inheritance and Variation Class 12

Chapter 5 Principles of Inheritance and Variation Exercise Solutions

Exercise : Solutions of Questions on Page Number : 93

Q1 :

Mention the advantages of selecting pea plant for experiment by Mendel.

Answer :

Mendel selected pea plants to carry out his study on the inheritance of characters from parents to offspring.

He selected a pea plant because of the following features.

- (a) Peas have many visible contrasting characters such as tall/dwarf plants, round/wrinkled seeds, green/yellow pod, purple/white flowers, etc.
- (b) Peas have bisexual flowers and therefore undergo self pollination easily. Thus, pea plants produce offsprings with same traits generation after generation.
- (c) In pea plants, cross pollination can be easily achieved by emasculation in which the stamen of the flower is removed without affecting the pistil.
- (d) Pea plants have a short life span and produce many seeds in one generation.

Q2 :

Differentiate between the following -

- (a) Dominance and Recessive
- (b) Homozygous and Heterozygous
- (c) Monohybrid and Dihybrid.

Answer :

(a) Dominance and Recessive

Dominance		Recessive
1.	A dominant factor or allele expresses itself in the presence or absence of a recessive trait.	A recessive trait is able to express itself only in the absence of a dominant trait.
2.	For example, tall plant, round seed, violet flower, etc. are dominant characters in a pea plant.	For example, dwarf plant, wrinkled seed, white flower, etc. are recessive traits in a pea plant.

(b) Homozygous and Heterozygous

Homozygous		Heterozygous
1.	It contains two similar alleles for a particular trait.	It contains two different alleles for a particular trait.
2.	Genotype for homozygous possess either dominant or recessive, but never both the alleles. For example, RR or rr	Genotype for heterozygous possess both dominant and recessive alleles. For example, Rr
3.	It produces only one type of gamete.	It produces two different kinds of gametes.

(c) Monohybrid and Dihybrid

Monohybrid		Dihybrid
1.	Monohybrid involves cross between parents, which differs in only one pair of contrasting characters.	Dihybrid involves cross between parents, which differs in two pairs of contrasting characters.
2.	For example, the cross between tall and dwarf pea plant is a monohybrid cross.	For example, the cross between pea plants having yellow wrinkled seed with those having green round seeds is a dihybrid cross.

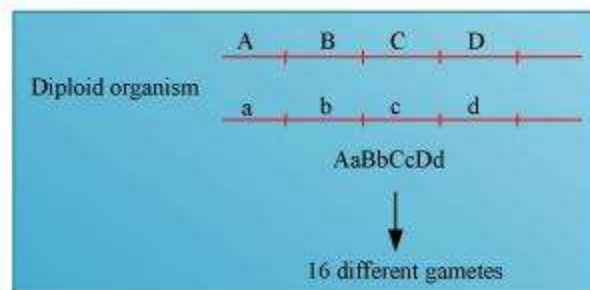
Q3 :

A diploid organism is heterozygous for 4 loci, how many types of gametes can be produced?

Answer :

Locus is a fixed position on a chromosome, which is occupied by a single or more genes. Heterozygous organisms contain different alleles for an allelic pair. Hence, a diploid organism, which is heterozygous at four loci, will have four different contrasting characters at four different loci.

For example, if an organism is heterozygous at four loci with four characters, say Aa, Bb, Cc, Dd, then during meiosis, it will segregate to form 8 separate gametes.



If the genes are not linked, then the diploid organism will produce 16 different gametes. However, if the genes are linked, the gametes will reduce their number as the genes might be linked and the linked genes will be inherited together during the process of meiosis.

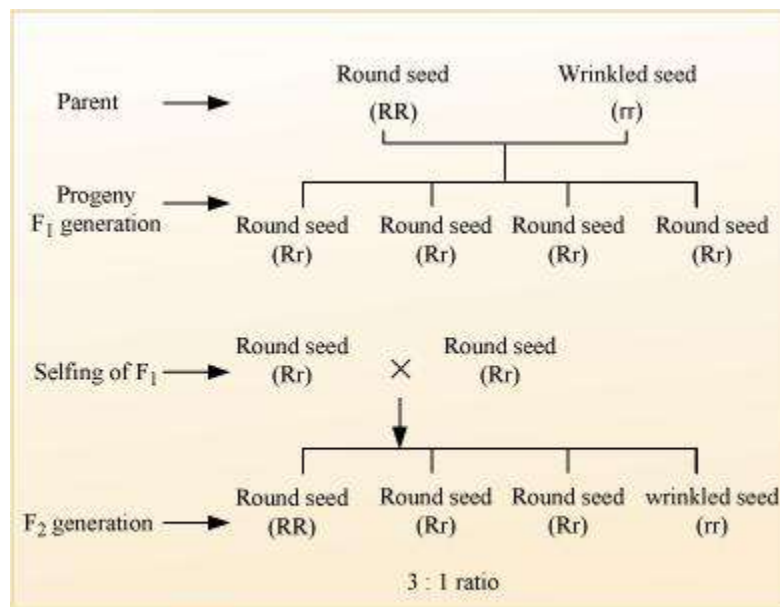
Q4 :

Explain the Law of Dominance using a monohybrid cross.

Answer :

Mendel's law of dominance states that a dominant allele expresses itself in a monohybrid cross and suppresses the expression of recessive allele. However, this recessive allele for a character is not lost and remains hidden or masked in the progenies of F_1 generation and reappears in the next generation.

For example, when pea plants with round seeds (RR) are crossed with plants with wrinkled seeds (rr), all seeds in F_1 generation were found to be round (Rr). When these round seeds were self fertilized, both the round and wrinkled seeds appeared in F_2 generation in 3: 1 ratio. Hence, in F_1 generation, the dominant character (round seeds) appeared and the recessive character (wrinkled seeds) got suppressed, which reappeared in F_2 generation.



A monohybrid cross between round and wrinkled pea seeds

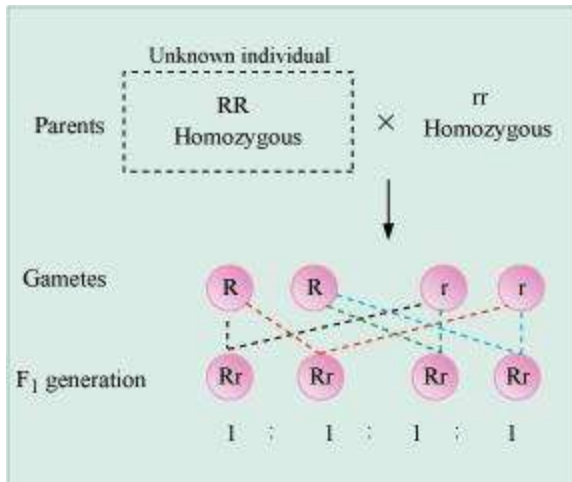
Q5 :

Define and design a test - cross?

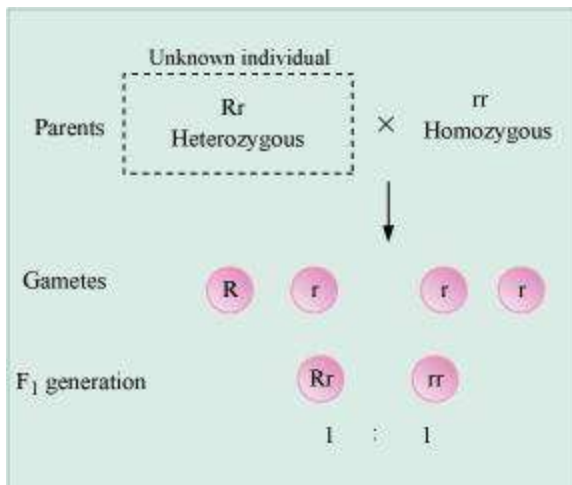
Answer :

Test cross is a cross between an organism with unknown genotype and a recessive parent. It is used to determine whether the individual is homozygous or heterozygous for a trait.

If the progenies produced by a test cross show 50% dominant trait and 50% recessive trait, then the unknown individual is heterozygous for a trait. On the other hand, if the progeny produced shows dominant trait, then the unknown individual is homozygous for a trait.



Cross between homozygous (unknown) individual and homozygous recessive individual



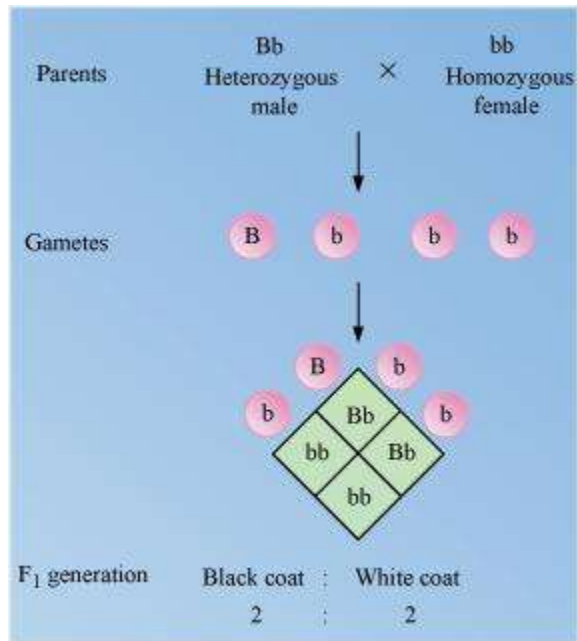
Cross between heterozygous (unknown) individual and homozygous recessive individual

Q6 :

Using a Punnett square, work out the distribution of phenotypic features in the first filial generation after a cross between a homozygous female and a heterozygous male for a single locus.

Answer :

In guinea pigs, heterozygous male with black coat colour (Bb) is crossed with the female having white coat colour (bb). The male will produce two types of gametes, B and b, while the female will produce only one kind of gamete, b. The genotypic and phenotypic ratio in the progenies of F₁ generation will be same i.e., 1:1.



Q7 :

When a cross is made between tall plants with yellow seeds (TtYy) and tall plant with green seed (TtYy), what proportions of phenotype in the offspring could be expected to be

- (a) Tall and green.
- (b) Dwarf and green.

Answer :

A cross between tall plant with yellow seeds and tall plant with green seeds will produce

- (a) three tall and green plants
- (b) one dwarf and green plant

Parents	Tall yellow seed plant TtYy	×	Tall green seed plant Ttyy															
Gametes	TY, Ty, tY, tY	↓	Ty, ty															
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Phenotypes :	Tall and green = 3 Dwarf and green = 1																	

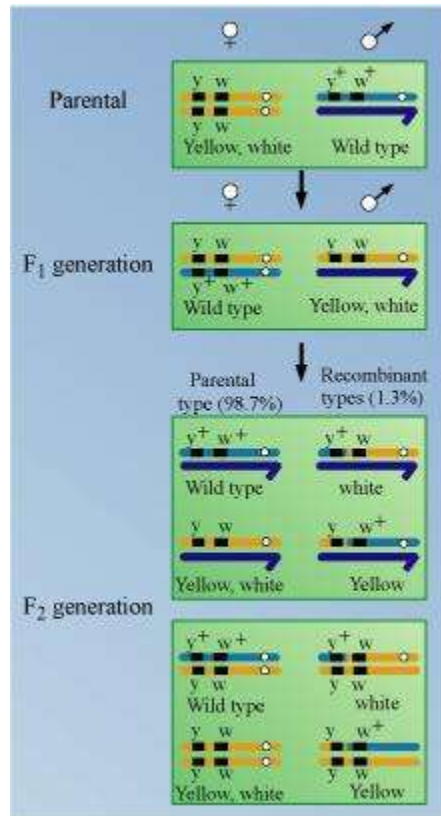
Q8 :

Two heterozygous parents are crossed. If the two loci are linked what would be the distribution of phenotypic features in F_1 generation for a dihybrid cross?

Answer :

Linkage is defined as the coexistence of two or more genes in the same chromosome. If the genes are situated on the same chromosome and lie close to each other, then they are inherited together and are said to be linked genes.

For example, a cross between yellow body and white eyes and wild type parent in a *Drosophila* will produce wild type and yellow white progenies. It is because yellow bodied and white eyed genes are linked. Therefore, they are inherited together in progenies.



Q9 :

Briefly mention the contribution of T.H. Morgan in genetics.

Answer :

Morgan's work is based on fruit flies (*Drosophila melanogaster*). He formulated the chromosomal theory of linkage. He defined linkage as the co-existence of two or more genes in the same chromosome and performed dihybrid crosses in *Drosophila* to show that linked genes are inherited together and are located on X-chromosome. His experiments have also proved that tightly linked genes show very low recombination while loosely linked genes show higher recombination.

Q10 :

What is pedigree analysis? Suggest how such an analysis, can be useful.

Answer :

Pedigree analysis is a record of occurrence of a trait in several generations of a family. It is based on the fact that certain characteristic features are heritable in a family, for example, eye colour, skin colour, hair form and colour, and other facial characteristics. Along with these features, there are other genetic disorders such as Mendelian disorders that are inherited in a family, generation after generation. Hence, by using pedigree analysis for the study of specific

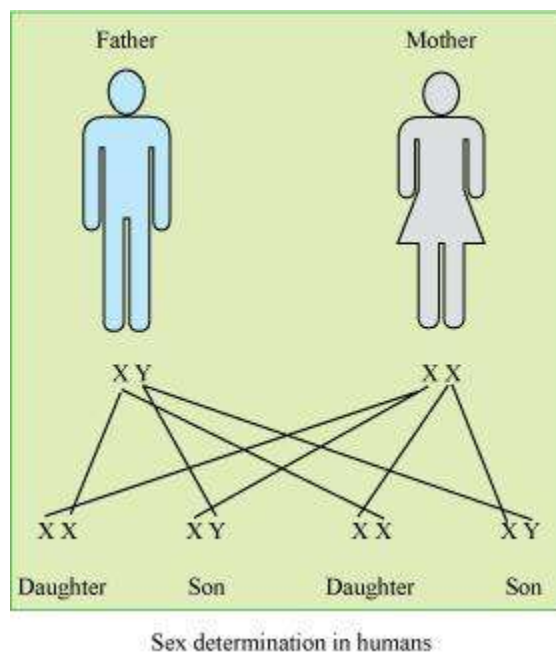
traits or disorders, generation after generation, it is possible to trace the pattern of inheritance. In this analysis, the inheritance of a trait is represented as a tree, called family tree. Genetic counselors use pedigree chart for analysis of various traits and diseases in a family and predict their inheritance patterns. It is useful in preventing hemophilia, sickle cell anemia, and other genetic disorders in the future generations.

Q11 :

How is sex determined in human beings?

Answer :

Human beings exhibit male heterogamy. In humans, males (XY) produce two different types of gametes, X and Y. The human female (XX) produces only one type of gametes containing X chromosomes. The sex of the baby is determined by the type of male gamete that fuses with the female gamete. If the fertilizing sperm contains X chromosome, then the baby produced will be a girl and if the fertilizing sperm contains Y chromosome, then the baby produced will be a boy. Hence, it is a matter of chance that determines the sex of a baby. There is an equal probability of the fertilizing sperm being an X or Y chromosome. Thus, it is the genetic make up of the sperm that determines the sex of the baby.



Q12 :

A child has blood group O. If the father has blood group A and mother blood group B, work out the genotypes of the parents and the possible genotypes of the other offsprings.

Answer :

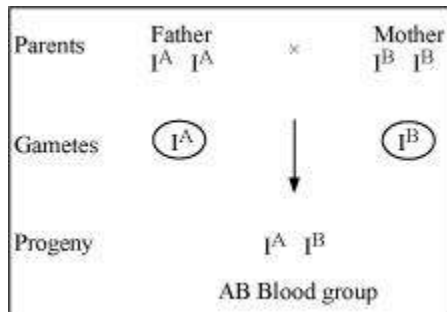
The blood group characteristic in humans is controlled by three set of alleles, namely, I^A , I^B , and i . The alleles, I^A and I^B , are equally dominant whereas allele, i , is recessive to the other alleles. The individuals with genotype, $I^A I^A$ and $I^A i$, have blood group A whereas the individuals with genotype, $I^B I^B$ and $I^B i$, have blood group B. The persons with genotype $I^A I^B$ have blood group AB while those with blood group O have genotype ii .

Hence, if the father has blood group A and mother has blood group B, then the possible genotype of the parents will be

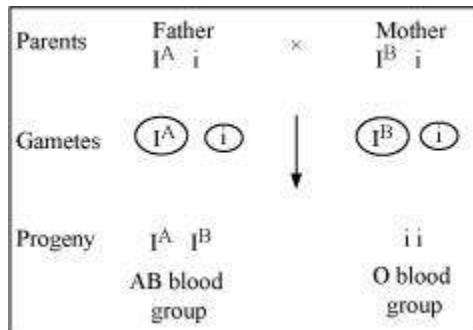
Father Mother

$I^A I^A$ or $I^A i$ $I^B I^B$ or $I^B i$

A cross between homozygous parents will produce progeny with AB blood group.



A cross between heterozygous parents will produce progenies with AB blood group ($I^A I^B$) and O blood group (ii).



Q13 :

Explain the following terms with example

(a) Co-dominance

(b) Incomplete dominance

Answer :

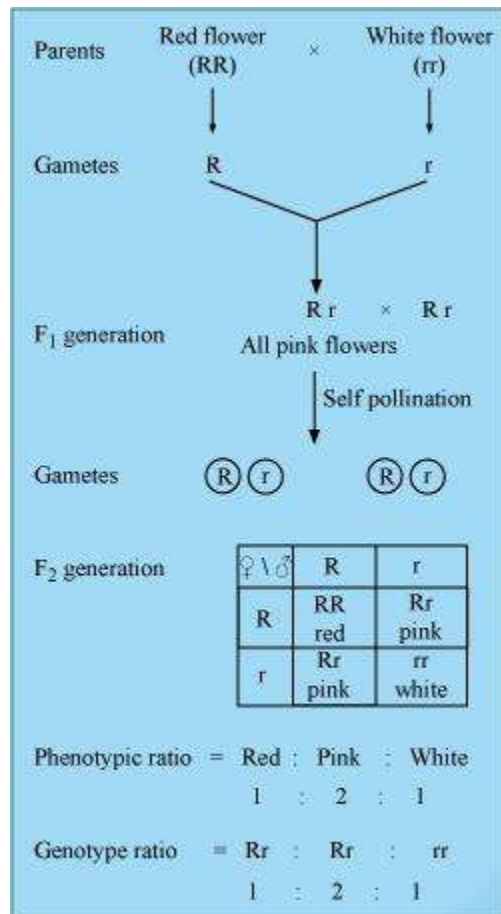
(a) Co-dominance

Co-dominance is the phenomenon in which both the alleles of a contrasting character are expressed in heterozygous condition. Both the alleles of a gene are equally dominant. ABO blood group in human beings is an example of co-dominance. The blood group character is controlled by three sets of alleles, namely, I^A , I^B , and i . The alleles, I^A and I^B , are equally dominant and are said to be co-dominant as they are expressed in AB blood group. Both these alleles do

not interfere with the expression of each other and produce their respective antigens. Hence, AB blood group is an example of co-dominance.

2. Incomplete dominance

Incomplete dominance is a phenomenon in which one allele shows incomplete dominance over the other member of the allelic pair for a character. For example, a monohybrid cross between the plants having red flowers and white flowers in *Antirrhinum* species will result in all pink flower plants in F_1 generation. The progeny obtained in F_1 generation does not resemble either of the parents and exhibits intermediate characteristics. This is because the dominant allele, R , is partially dominant over the other allele, r . Therefore, the recessive allele, r , also gets expressed in the F_1 generation resulting in the production of intermediate pink flowering progenies with Rr genotype.



Q14 :

What is point mutation? Give one example.

Answer :

Point mutation is a change in a single base pair of DNA by substitution, deletion, or insertion of a single nitrogenous base. An example of point mutation is sickle cell anaemia. It involves mutation in a single base pair in the beta-globin chain of haemoglobin pigment of the blood. Glutamic acid in short arm of chromosome II gets replaced with valine at the sixth position.

Q15 :

Who had proposed the chromosomal theory of inheritance?

Answer :

Sutton and Boveri proposed the chromosomal theory of inheritance in 1902. They linked the inheritance of traits to the chromosomes.

Q16 :

Mention any two autosomal genetic disorders with their symptoms.

Answer :

Two autosomal genetic disorders are as follows.

1. Sickle cell Anaemia

It is an autosomal linked recessive disorder, which is caused by point mutation in the beta-globin chain of haemoglobin pigment of the blood. The disease is characterized by sickle shaped red blood cells, which are formed due to the mutant haemoglobin molecule. The disease is controlled by Hb^A and Hb^s allele. The homozygous individuals with genotype, Hb^sHb^s , show the symptoms of this disease while the heterozygous individuals with genotype, $Hb^A Hb^s$, are not affected. However, they act as carriers of the disease.

Symptoms

Rapid heart rate, breathlessness, delayed growth and puberty, jaundice, weakness, fever, excessive thirst, chest pain, and decreased fertility are the major symptoms of sickle cell anaemia disease.

(b) Down's syndrome

It is an autosomal disorder that is caused by the trisomy of chromosome 21.

Symptoms

The individual is short statured with round head, open mouth, protruding tongue, short neck, slanting eyes, and broad short hands. The individual also shows retarded mental and physical growth.

NCERT Solutions for Class 12 Biology Chapter 8

Human Health and Disease Class 12

Chapter 8 Human Health and Disease Exercise Solutions

Exercise : Solutions of Questions on Page Number : 164

Q1 :

What are the various public health measures, which you would suggest as safeguard against infectious diseases?

Answer :

Public health measures are preventive measures which are taken to check the spread of various infectious diseases. These measures should be taken to reduce the contact with infectious agents.

Some of these methods are:

- (1) Maintenance of personal and public hygiene: It is one of the most important methods of preventing infectious diseases. This measure includes maintaining a clean body, consumption of healthy and nutritious food, drinking clean water, etc. Public hygienic includes proper disposal of waste material, excreta, periodic cleaning, and disinfection of water reservoirs.
- (2) Isolation: To prevent the spread of air-borne diseases such as pneumonia, chicken pox, tuberculosis, etc., it is essential to keep the infected person in isolation to reduce the chances of spreading these diseases.
- (3) Vaccination: Vaccination is the protection of the body from communicable diseases by administering some agent that mimics the microbe inside the body. It helps in providing passive immunization to the body. Several vaccines are available against many diseases such as tetanus, polio, measles, mumps, etc.
- (4) Vector Eradication: Various diseases such as malaria, filariasis, dengue, and chikungunya spread through vectors. Thus, these diseases can be prevented by providing a clean environment and by preventing the breeding of mosquitoes. This can be achieved by not allowing water to stagnate around residential areas. Also, measures like regular cleaning of coolers, use of mosquito nets and insecticides such as malathion in drains, ponds, etc. can be undertaken to ensure a healthy environment. Introducing fish such as *Gambusia* in ponds also controls the breeding of mosquito larvae in stagnant water.

Q2 :

In which way has the study of biology helped us to control infectious diseases?

Answer :

Various advancements that have occurred in the field of biology have helped us gain a better understanding to fight against various infectious diseases. Biology has helped us study the life cycle of various parasites, pathogens, and vectors along with the modes of transmission of various diseases and the measures for controlling them. Vaccination programmes against several infectious diseases such as small pox, chicken pox, tuberculosis, etc. have helped eradicate these diseases. Biotechnology has helped in the preparation of newer and safer drugs and vaccines. Antibiotics have also played an important role in treating infectious diseases.

Q3 :

How does the transmission of each of the following diseases take place?

- (a) Amoebiasis
- (b) Malaria
- (c) Ascariasis
- (d) Pneumonia

Answer :

	Disease	Causative organism	Mode of transmission
a.	Amoebiasis	<i>Entamoeba histolytica</i>	It is a vector-borne disease that spreads by the means of contaminated food and water. The vector involved in the transmission of this disease is the housefly.
b.	Malaria	<i>Plasmodium sp.</i>	It is a vector-borne disease that spreads by the biting of the female <i>Anopheles</i> mosquito.
c.	Ascariasis	<i>Ascaris lumbricoides</i>	It spreads via contaminated food and water.
d.	Pneumonia	<i>Streptococcus pneumoniae</i>	It spreads by the sputum of an infected person.

Q4 :

What measure would you take to prevent water-borne diseases?

Answer :

Water-borne diseases such as cholera, typhoid, hepatitis B, etc. spread by drinking contaminated water. These water-borne diseases can be prevented by ensuring proper disposal of sewage, excreta, periodic cleaning. Also, measures such as disinfecting community water reservoirs, boiling drinking water, etc. should be observed.

Q5 :

Discuss with your teacher what does 'a suitable gene' means, in the context of DNA vaccines.

Answer :

A 'suitable gene' refers to a specific DNA segment which can be injected into the cells of the host body to produce specific proteins. This protein kills the specific disease-causing organism in the host body and provides immunity.

Q6 :

Name the primary and secondary lymphoid organs.

Answer :

(a) Primary lymphoid organs include the bone marrow and the thymus.

(b) Secondary lymphoid organs are the spleen, lymph nodes, tonsils, Peyer's patches of small intestine, and appendix.

Q7 :

The following are some well-known abbreviations, which have been used in this chapter. Expand each one to its full form:

(a) MALT

(b) CMI

(c) AIDS

(d) NACO

(e) HIV

Answer :

(a) MALT- Mucosa-Associated Lymphoid Tissue

(b) CMI- Cell-Mediated Immunity

(c) AIDS- Acquired Immuno Deficiency Syndrome

(d) NACO- National AIDS Control Organization

(e) HIV- Human Immuno Deficiency virus

Q8 :

Differentiate the following and give examples of each:

(a) Innate and acquired immunity

(b) Active and passive immunity

Answer :

(a) Innate and acquired immunity

	Innate immunity		Acquired immunity
1.	It is a non - pathogen specific type of defense mechanism.	1.	It is a pathogen specific type of defense mechanism.
2.	It is inherited from parents and protects the individual since birth.	2.	It is acquired after the birth of an individual.
3.	It operates by providing barriers against the entry of foreign infectious agents.	3.	It operates by producing primary and secondary responses, which are mediated by B - lymphocytes and T-lymphocytes.
4	It does not have a specific memory.	4	It is characterized by an immunological memory.

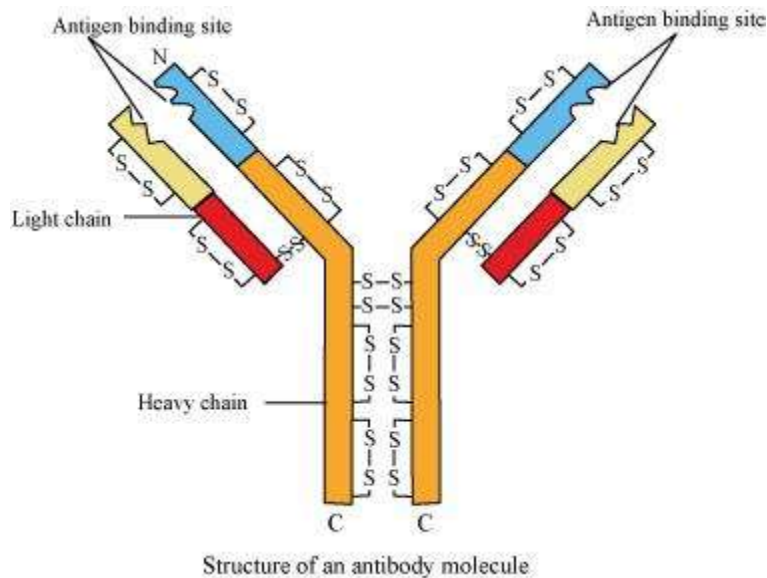
(b) Active and passive immunity

	Active immunity		Passive immunity
1.	It is a type of acquired immunity in which the body produces its own antibodies against disease-causing antigens.	1.	It is a type of acquired immunity in which readymade antibodies are transferred from one individual to another.
2.	It has a long lasting effect.	2.	It does not have long lasting effect.
3.	It is slow. It takes time in producing antibodies and giving responses.	3.	It is fast. It provides immediate relief.
4.	Injecting microbes through vaccination inside the body is an example of active immunity.	4.	Transfer of antibodies present in the mother's milk to the infant is an example of passive immunity.

Q9 :

Draw a well-labelled diagram of an antibody molecule.

Answer :



Q10 :

What are the various routes by which transmission of human immunodeficiency virus takes place?

Answer :

AIDS (Acquired Immuno Deficiency Syndrome) is caused by the Human immunodeficiency virus (HIV).

It has the following modes of transmission:

- (a) Unprotected sexual contact with an infected person.
- (b) Transfusion of blood from a healthy to an infected person.
- (c) Sharing infected needles and syringes.
- (d) From an infected mother to a child through the placenta.

Q11 :

What is the mechanism by which the AIDS virus causes deficiency of immune system of the infected person?

Answer :

AIDS (Acquired Immuno Deficiency Syndrome) is caused by the Human immunodeficiency virus (HIV) via sexual or blood-blood contact. After entering the human body, the HIV virus attacks and enters the macrophages. Inside the macrophages, the RNA of the virus replicates with the help of enzyme reverse transcriptase and gives rise to viral DNA. Then, this viral DNA incorporates into the host DNA and directs the synthesis of virus particles. At the same time, HIV enters helper T- lymphocytes. It replicates and produces viral progeny there. These newly formed progeny viruses get released into the blood, attacking other healthy helper T-lymphocytes in the body. As a result, the number

of T-lymphocytes in the body of an infected person decreases progressively, thereby decreasing the immunity of a person.

Q12 :

How is a cancerous cell different from a normal cell?

Answer :

	Normal cell		Cancerous cell
1.	Normal cells show the property of contact inhibition. Therefore, when these cells come into contact with other cells, they stop dividing.	1	Cancerous cells lack the property of contact inhibition. Therefore, they continue to divide, thereby forming a mass of cells or tumor.
2.	They undergo differentiation after attaining a specific growth.	2.	They do not undergo differentiation.
3.	These cells remain confined at a particular location.	3	These cells do not remain confined at a particular location. They move into neighboring tissues and disturb its function.

Q13 :

Explain what is meant by metastasis.

Answer :

The property of metastasis is exhibited by malignant tumors. It is the pathological process of spreading cancerous cells to the different parts of the body. These cells divide uncontrollably, forming a mass of cells called tumor. From the tumor, some cells get sloughed off and enter into the blood stream. From the blood stream, these cells reach distant parts of the body and therefore, initiate the formation of new tumors by dividing actively.

Q14 :

List the harmful effects caused by alcohol/drug abuse.

Answer :

Alcohol and drugs have several adverse effects on the individual, his family, and the society.

A. Effects of alcohol:

Effects on the individual: Alcohol has an adverse effect on the body of an individual. When an individual consumes excess alcohol, it causes damage to the liver and the nervous system. As a result, other symptoms such as depression, fatigue, aggression, loss of weight and appetite may also be observed in the individual. Sometimes,

extreme levels of alcohol consumption may also lead to heart failure, resulting coma and death. Also, it is advisable for pregnant women to avoid alcohol as it may inhibit normal growth of the baby.

Effects on the family: Consumption of excess alcohol by any family member can have devastating effects on the family. It leads to several domestic problems such as quarrels, frustrations, insecurity, etc.

Effects on the society:

- (a) Rash behavior
- (b) Malicious mischief and violence
- (c) Deteriorating social network
- (d) Loss of interest in social and other activities

B Effects of drugs: An individual who is addicted to drugs creates problems not only for himself but also for his family.

Effects on the individual: Drugs have an adverse effect on the central nervous system of an individual. This leads to the malfunctioning of several other organs of the body such as the kidney, liver, etc. The spread of HIV is most common in these individuals as they share common needles while injecting drugs in their body. Drugs have long-term side effects on both males and females. These side effects include increased aggressiveness, mood swings, and depression

Effects on the family and society: A person addicted to drugs creates problems for his family and society. A person dependant on drugs becomes frustrated, irritated, and anti-social.

Q15 :

Do you think that friends can influence one to take alcohol/drugs? If yes, how may one protect himself/herself from such an influence?

Answer :

Yes, friends can influence one to take drugs and alcohol. A person can take the following steps for protecting himself/herself against drug abuse:

- (a) Increase your will power to stay away from alcohol and drugs. One should not experiment with alcohol for curiosity and fun.
- (b) Avoid the company of friends who take drugs.
- (c) Seek help from parents and peers.
- (d) Take proper knowledge and counseling about drug abuse. Devote your energy in other extra-curricular activities.
- (e) Seek immediate professional and medical help from psychologists and psychiatrists if symptoms of depression and frustration become apparent.

Q16 :

Why is that once a person starts taking alcohol or drugs, it is difficult to get rid of this habit? Discuss it with your teacher.

Answer :

Drug and alcohol consumption has an inherent addictive nature associated with euphoria and a temporary feeling of well-being. Repeated intake of drugs increases the tolerance level of the body's receptors, leading to more consumption of drugs.

Q17 :

In your view what motivates youngsters to take to alcohol or drugs and how can this be avoided?

Answer :

Many factors are responsible for motivating youngsters towards alcohol or drugs. Curiosity, need for adventure and excitement, experimentation are the initial causes of motivation. Some youngsters start consuming drugs and alcohol in order to overcome negative emotions (such as stress, pressure, depression, frustration) and to excel in various fields. Several mediums like television, internet, newspaper, movies etc. are also responsible for promoting the idea of alcohol to the younger generation. Amongst these factors, reasons such as unstable and unsupportive family structures and peer pressure can also lead an individual to be dependant on drugs and alcohol.

Preventive measures against addiction of alcohol and drugs:

- (a)** Parents should motivate and try to increase the will power of their child.
- (b)** Parents should educate their children about the ill-effects of alcohol. They should provide them with proper knowledge and counselling regarding the consequences of addiction to alcohol.
- (c)** It is the responsibility of the parent to discourage a child from experimenting with alcohol. Youngsters should be kept away from the company of friends who consume drugs.
- (d)** Children should be encouraged to devote their energy in other extra- curricular and recreational activities.
- (e)** Proper professional and medical help should be provided to a child if sudden symptoms of depression and frustration are observed.

NCERT Solutions for Class 12 Biology Chapter 9

Strategies for Enhancement in Food Production Class 12

Chapter 9 Strategies for Enhancement in Food Production Exercise Solutions

Exercise : Solutions of Questions on Page Number : 178

Q1 :

Explain in brief the role of animal husbandry in human welfare.

Answer :

Animal husbandry deals with the scientific management of livestock. It includes various aspects such as feeding, breeding, and control diseases to raise the population of animal livestock. Animal husbandry usually includes animals such as cattle, pig, sheep, poultry, and fish which are useful for humans in various ways. These animals are managed for the production of commercially important products such as milk, meat, wool, egg, honey, silk, etc. The increase in human population has increased the demand of these products. Hence, it is necessary to improve the management of livestock scientifically.

Q2 :

If your family owned a dairy farm, what measures would you undertake to improve the quality and quantity of milk production?

Answer :

Dairy farm management deals with processes which aim at improving the quality and quantity of milk production. Milk production is primarily dependent on choosing improved cattle breeds, provision of proper feed for cattle, maintaining proper shelter facilities, and regular cleaning of cattle.

Choosing improved cattle breeds is an important factor of cattle management. Hybrid cattle breeds are produced for improved productivity. Therefore, it is essential that hybrid cattle breeds should have a combination of various desirable genes such as high milk production and high resistance to diseases. Cattle should also be given healthy and nutritious food consisting of roughage, fibre concentrates, and high levels of proteins and other nutrients.

Cattle's should be housed in proper cattle-houses and should be kept in well ventilated roofs to prevent them from harsh weather conditions such as heat, cold, and rain. Regular baths and proper brushing should be ensured to control diseases. Also, time-to-time check ups by a veterinary doctor for symptoms of various diseases should be undertaken.

Q3 :

What is meant by the term 'breed'? What are the objectives of animal breeding?

Answer :

A breed is a special variety of animals within a species. It is similar in most characters such as general appearance, size, configuration, and features with other members of the same species. Jersey and Brown Swiss are examples of foreign breeds of cattle. These two varieties of cattle have the ability to produce abundant quantities of milk. This milk is very nutritious with high protein content.

Objectives of animal breeding:

- (i) To increase the yield of animals.
- (ii) To improve the desirable qualities of the animal produce.
- (iii) To produce disease-resistant varieties of animals.

Q4 :

Name the methods employed in animal breeding. According to you which one of the methods is best? Why?

Answer :

Animal breeding is the method of mating closely related individuals. There are several methods employed in animals breeding, which can be classified into the following categories:

(A) Natural methods of breeding include inbreeding and out-breeding. Breeding between animals of the same breed is known as inbreeding, while breeding between animals of different breeds is known as out-breeding. Out-breeding of animals is of three types:

(a). Out-crossing: In this type of out-breeding, the mating of animals occurs within the same breed. Thus, they have no common ancestors up to the last 4-5 generations.

(b). Cross-breeding: In this type of out-breeding, the mating occurs between different breeds of the same species, thereby producing a hybrid.

(c). Interspecific hybridization: In this type of out-breeding, the mating occurs between different species.

(B) Artificial methods of breeding include modern techniques of breeding. It involves controlled breeding experiments, which are of two types:-

(a). Artificial insemination: It is a process of introducing the semen (collected from the male) into the oviduct or the uterus of the female body by the breeder. This method of breeding helps the breeder overcome certain problems faced in abnormal mating.

(b). Multiple ovulation embryo technology (MOET): It is a technique for cattle improvement in which super-ovulation is induced by a hormone injection. Then, fertilization is achieved by artificial insemination and early embryos are collected. Each of these embryos are then transplanted into the surrogate mother for further development of the embryo.

The best method to carry out animal breeding is the artificial method of breeding, which includes artificial insemination and MOET technology. These technologies are scientific in nature. They help overcome problems of normal mating and have a high success rate of crossing between mature males and females. Also, it ensures the production of hybrids with the desired qualities. This method is highly economical as a small amount of semen from the male can be used to inseminate several cattle.

Q5 :

What is apiculture? How is it important in our lives?

Answer :

Apiculture is the practice of bee-keeping for the production of various products such as honey, bee's wax, etc. Honey is a highly nutritious food source and is used as an indigenous system of medicines. It is useful in the treatment of many disorders such as cold, flu, and dysentery. Other commercial products obtained from honey bees include bee's wax and bee pollen. Bee's wax is used for making cosmetics, polishes, and is even used in several medicinal preparations. Therefore, to meet the increasing demand of honey, people have started practicing bee-keeping on a large scale. It has become an income generating activity for farmers since it requires a low investment and is labour intensive.

Q6 :

Discuss the role of fishery in enhancement of food production.

Answer :

Fishery is an industry which deals with catching, processing, and marketing of fishes and other aquatic animals that have a high economic value. Some commercially important aquatic animals are prawns crabs, oysters, lobsters, and octopus. Fisheries play an important role in the Indian economy. This is because a large part of the Indian population is dependent on fishes as a source of food, which is both cheap and high in animal protein. A Fishery is an employment generating industry especially for people staying in the coastal areas. Both fresh water fishes (such as Catla, Rohu, etc) and marine fishes (such as tuna, mackerel pomfret, etc.) are of high economic value.

Q7 :

Briefly describe various steps involved in plant breeding.

Answer :

Plant breeding is the process in which two genetically dissimilar varieties are purposely crossed to produce a new hybrid variety. As a result, characteristics from both parents can be obtained in the hybrid plant variety. Thus, it involves the production of a new variety with the desired characteristics such as resistance to diseases, climatic adaptability, and better productivity. The various steps involved in plant breeding are as follows:

- (a).** Collection of genetic variability: Genetic variability from various wild relatives of the cultivated species are collected to maintain the genetic diversity of a species. The entire collection of the diverse alleles of a gene in a crop is called the germplasm collection.
- (b).** Evaluation of germplasm and selection of parents: The germplasm collected is then evaluated for the desirable genes. The selected plants with the desired genes are then used as parents in plant breeding experiments and are multiplied by the process of hybridization.
- (c).** Cross-hybridization between selected parents: The next step in plant breeding is to combine the desirable characters present in two different parents to produce hybrids. It is a tedious job as one has to ensure that the pollen grains collected from the male parent reach the stigma of the female parent.

(d). Selection of superior hybrids: The progenies of the hybrids having the desired characteristics are selected through scientific evaluation. The selected progenies are then self-pollinated for several generations to ensure homozygosity.

(e). Testing, release, and commercialization of new cultivars: The selected progenies are evaluated for characters such as yield, resistance to diseases, performance, etc. by growing them in research fields for at least three growing seasons in different parts of the country. After thorough testing and evaluation, the selected varieties are given to the farmers for growing in fields for a large-scale production.

Q8 :

Explain what is meant by biofortification.

Answer :

Biofortification is a process of breeding crops with higher levels of vitamins, minerals, proteins, and fat content. This method is employed to improve public health. Breeding of crops with improved nutritional quality is undertaken to improve the content of proteins, oil, vitamins, minerals, and micro-nutrients in crops. It is also undertaken to upgrade the quality of oil and proteins. An example of this is a wheat variety known as Atlas 66, which has high protein content in comparison to the existing wheat. In addition, there are several other improved varieties of crop plants such as rice, carrots, spinach etc. which have more nutritious value and more nutrients than the existing varieties.

Q9 :

Which part of the plant is best suited for making virus-free plants and why?

Answer :

Apical and axillary meristems of plants is used for making virus-free plants. In a diseased plant, only this region is not infected by the virus as compared to the rest of the plant region. Hence, the scientists remove axillary and apical meristems of the diseased plant and grow it *in vitro* to obtain a disease-free and healthy plant.

Virus-free plants of banana, sugarcane, and potato have been obtained using this method by scientists.

Q10 :

What is the major advantage of producing plants by micropropagation?

Answer :

Micropropagation is a method of producing new plants in a short duration using plant tissue culture.

Some major advantages of micropropagation are as follows:

(a) Micropropagation helps in the propagation of a large number of plants in a short span of time.

(b) The plants produced are identical to the mother plant.

(c) It leads to the production of healthier plantlets, which exhibit better disease-resisting powers.

Q11 :

Find out what the various components of the medium used for propagation of explants *in vitro* are?

Answer :

The major components of medium used for propagation of explants *in vitro* are carbon sources such as sucrose, inorganic salts, vitamins, amino acids, water, *agar-agar*, and certain growth hormones such as auxins and gibberellins.

Q12 :

Name any five hybrid varieties of crop plants which have been developed in India.

Answer :

The five hybrid varieties of crop plants which have been developed in India are:

Crop plant	Hybrid variety
Wheat	Sonalika and kalia sona
Rice	Jaya and Ratna
Cauliflower	Pusa shubra and Pusa snowball K-1
Cowpea	Pusa komal
Mustard	Pusa swarnim