SAMPLE QUESTION PAPER

BLUE PRINT

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

S. No.		Chapter	VSA /Case based/ AR (1 mark)	SA-I (2 marks)	SA-II (3 marks)	LA (5 marks)	Total	
1.	Unit-VI	Sexual Reproduction in Flowering Plants	3(3)	1(2)	–	1*	**4(5)**	**14**
2.		Human Reproduction	1(1)	–	–	1(5)	**2(6)**	
3.		Reproductive Health	–	–	1(3)	–	**1(3)**	
4.	Unit-VII	Principles of Inheritance and Variation	2(2)	–	1+1*(3)	1+1*(5)	**4(10)**	**18**
5.		Molecular Basis of Inheritance	3(6)	1(2)	–	–	**4(8)**	
6.	Unit-VIII	Human Health and Diseases	–	1(2)	1(3)	1(5)	**3(10)**	**14**
7.		Microbes in Human Welfare	–	2(4)	–	1*	**2(4)**	
8.	Unit-IX	Biotechnology : Principles and Processes	1+1*(1)	2+2*(4)	–	–	**3(5)**	**12**
9.		Biotechnology and Its Applications	2(2)	1(2)	1(3)	–	**4(7)**	
10.	Unit-X	Organisms and Populations	2(2)	1(2)	1(3)	–	**4(7)**	**12**
11.		Biodiversity and Conservation	2(5)	–	–	–	**2(5)**	
		Total	**16(22)**	**9(18)**	**5(15)**	**3(15)**	**33(70)**	

*It is a choice based question.

Subject Code : 044

BIOLOGY

Time allowed : 3 hours ***Maximum 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 has 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 and Section-D has 3 questions of 5 marks each.

(iv) There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.

(v) Wherever necessary, neat and properly labeled diagrams should be drawn.

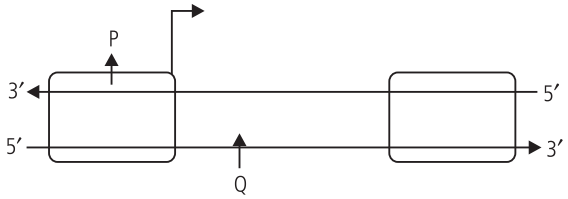
SECTION - A

1. State two methods of apomictic development in seeds.

2. What will be the ploidy level of cells of endothecium, tapetum, sporogenous tissue and microspore tetrads respectively?

3. Name the hormones which stimulate milk production and milk ejection respectively.

4. In the given diagrammatic representation of the transcription "unit", what do the parts P and Q represent?



5. On what basis is the skin colour in humans considered polygenic?

6. State the fate of a pair of autosomes during gamete formation.

7. Why is RNA more reactive in comparison to DNA?

8. There are three types of restriction endonucleases. Which among the three is/are used in recombinant DNA technology?

9. Name the transgenic plant from which hirudin is extracted.

10. Which type of biological interaction is present between sucker fish and shark?

11. **Assertion :** ADA deficiency cannot be cured permanently by gene therapy.
Reason : The genetically engineered lymphocytes are immortal only in culture conditions.
(a) Both assertion and reason are true, and reason is the correct explanation of assertion.

(b) Both assertion and reason are true, but reason is not the correct explanation of assertion.
(c) Assertion is true but reason is false.
(d) Both assertion and reason are false.

OR

Assertion : PCR is routinely used for early diagnosis of HIV in suspected AIDS patients.
Reason : PCR can detect low amounts of DNA.
(a) Both assertion and reason are true, and reason is the correct explanation of assertion.
(b) Both assertion and reason are true, but reason is not the correct explanation of assertion.
(c) Assertion is true but reason is false.
(d) Both assertion and reason are false.

12. **Assertion :** In secretory tapetum, the tapetal cells fuse to form a plasmodium because it passes in between the sporogenous cells to nourish them.
Reason : The cells of amoeboid tapetum pass out substances over the sporogenous cells for their growth and differentiation.
(a) Both assertion and reason are true, and reason is the correct explanation of assertion.
(b) Both assertion and reason are true, but reason is not the correct explanation of assertion.
(c) Assertion is true but reason is false.
(d) Both assertion and reason are false.

13. **Assertion :** Periodic migration occurs in Arctic tern when their number increases beyond the feeding capacity of the homeland.
Reason : Arctic tern migrate in search of food.
(a) Both assertion and reason are true, and reason is the correct explanation of assertion.
(b) Both assertion and reason are true, but reason is not the correct explanation of assertion.
(c) Assertion is true but reason is false.
(d) Both assertion and reason are false.

14. **Assertion :** Maximum biodiversity occurs in temperate areas.
Reason : Temperate areas have favourable conditions for speciation and for supporting variety and number of organisms.
(a) Both assertion and reason are true, and reason is the correct explanation of assertion.
(b) Both assertion and reason are true, but reason is not the correct explanation of assertion.
(c) Assertion is true but reason is false.
(d) Both assertion and reason are false.

15. **Read the following and answer any four questions from 15(i) to 15(v) given below:**
Biodiversity refers to diversity at all levels of biological organisation ranging from macromolecules inside the cells to biomes. There are three levels of diversity ; bacteriophage with 100 genes and *E.coli* with 400 genes show diversity *X*. It is related to number of genes and their allele found in organisms. Diversity *Y* is shown by a community having three different species represented by 4, 1 and 1 individuals and a community having three bird species with two individuals of each species related to number and distribution of species found in an area. Deserts, rainforests, coral reefs, etc. show diversity *Z*. It represents variety of forms in the ecosystem due to diversity of niches, trophic levels and ecological processes.

(i) Which diversity is shown by varieties of rice and mango?
(a) *X*, genetic diversity
(b) *Y*, species diversity
(c) *Z*, α-ecological diversity
(d) *X, Y*-diversity

(ii) Which of the following statements is incorrect?
(a) Genetic diversity is trait of species.
(b) Species diversity is the variety in the number and richness of species of a region.

(c) Beta diversity is a species diversity in a given community or habitat.
(d) Species diversity influences biotic interactions.

(iii) _____ is the number of species per unit area, while number of individuals of different species represent _____ .

(a) species evenness, species richness
(b) species richness, species evenness
(c) species evenness, species equitability
(d) species evenness, species unevenness

(iv) Select the correct option for diversity *Y*.

(a) It is a trait of the community.
(b) It influences biotic interactions.
(c) It is related to number and distribution of species.
(d) All of these

(v) **Assertion :** Diversity helps in producing stable ecosystems.
Reason : Diverse communities can tolerate adverse environmental conditions.

(a) Both assertion and reason are true, and reason is the correct explanation of assertion.
(b) Both assertion and reason are true, but reason is not the correct explanation of assertion.
(c) Assertion is true but reason is false.
(d) Both assertion and reason are false.

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

While studying about the structure of human genetic material, DNA in the class, teacher taught the class about hydrogen bonding between complementary bases of antiparallel nucleotide chains. A student asked the teacher about detailed double helical structure of DNA and its *X*-ray crystallographic structure.

(i) What is the pitch of helix per turn?

(a) 3.4 nm
(b) 34 nm
(c) 0.34 nm
(d) 3.4 Å

(ii) Identify the number of hydrogen bonds present between complementary bases.

(a) A = T ; C = G
(b) A – T ; C – G
(c) A – T ; C = G
(d) A = T ; C ≡ G

(iii) Select the correct statement regarding DNA.

(a) Watson and Crick proposed double helical structure of DNA through X-ray diffraction.
(b) Two chains of DNA are parallel to each other in same direction.
(c) Two chains of double helix have sugar phosphate backbone and nitrogen bases on inner side.
(d) DNA shows conservative replication as both strands function as template.

(iv) If sequence of one chain of DNA is AAGCTCAG, then what would be the sequence of complementary strand?

(a) TTGCAGTC
(b) TTCGAGTC
(c) TTCCAGTC
(d) TTCGAGTG

(v) **Assertion :** Two chains of DNA run parallel but in opposite direction.
Reason : Direction in one chain is 5′ → 3′ and in other is 3′ → 5′.

(a) Both assertion and reason are true, and reason is the correct explanation of assertion.
(b) Both assertion and reason are true, but reason is not the correct explanation of assertion.
(c) Assertion is true but reason is false.
(d) Both assertion and reason are false.

SECTION - B

17. A bilobed dithecous anther contains 50 pollen mother cells (PMCs) per microsporangium. How many male gametophytes can be produced by this anther?

18. How does a single *t*RNA type recognise more than one codon on *m*RNA?

19. Briefly describe cyclosporin-A.

20. Explain how 'Rosie' is considered different from a normal cow.

21. **(a)** What is a bioreactor? Mention an advantage and a disadvantage of it.
(b) Name the types of commonly used bioreactors.

OR

In the experiment of cloning a gene, what would be the effect of a plasmid without a selectable marker?

22. Explain the nature of the given gene sequence.
5′ – GAATTC – 3′
3′ – CTTAAG – 5′

OR

What is the contribution of Cohen and Boyer in the field of biotechnology?

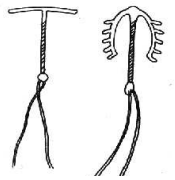
23. Name the plant source of ganja. How does it affect the body of the abuser?

24. How do mycorrhizae act as biofertilisers? Explain. Name a genus of fungi that forms a mycorrhizal association with plants.

25. Differentiate between parasitism and competition, giving one example of each. State the common characteristic they share.

SECTION - C

26. Answer the given questions based on following figures.

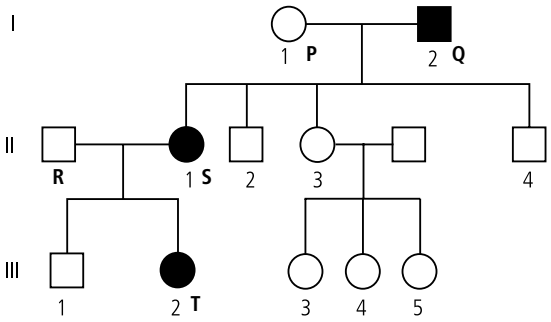


(i) Identify the devices *P* and *Q*.
(ii) What are their utility?

27. Incomplete dominance is not an example of pre-Mendelian concept of blending inheritance. Justify the statement.

OR

Refer to the given figure and answer the following questions.



(i) Identify the genotype for the individuals P, Q, R, S and T in the given figure.
(ii) Briefly describe the characteristics of the trait traced in the given figure.

28. Mention the special adaptations evolved in parasites and why?

29. **(a)** How is mature insulin different from proinsulin secreted by pancreas in humans?
(b) How human functional insulin is produced using *r*DNA technology?
(c) Why is the functional insulin thus produced, considered better than the ones used earlier by diabetic patients?

30. **(a)** Draw a well-labelled diagram of an antibody molecule.
(b) Which type of antibody is produced during allergic reaction?

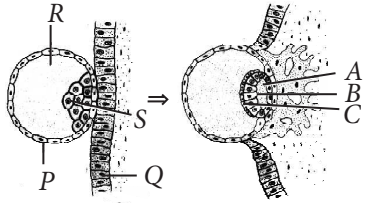
SECTION - D

31. **(a)** What is the significance of a test cross in cross breeding experiments?
(b) A child has blood group 'O'. If father has blood group 'A' and mother has blood group 'B', work out the genotypes of the parents and the possible genotypes of the other offsprings.

OR

(a) Who proposed the chromosomal theory of inheritance? State its salient features.
(b) What would be the inheritance pattern in F_1 generation for a dihybrid cross between two heterozygous parents, with the two loci of their gene pairs closely linked?

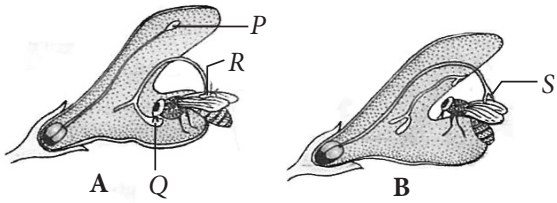
32. Refer to the following figures of embryo implantation and answer the following questions.



(i) Identify the structure P, Q, R, S and A.
(ii) Explain the embryonic disc with the help of given figure. Which cells in structure S give rise to it?
(iii) Describe the phenomenon of implantation in brief.

OR

Given figure shows the special adaptation in a flower for pollination.



(i) Identify the structure P, Q and R. Recognise the type of flower based on contrivance present in it.
(ii) What is structure S? Describe its role.
(iii) Name the mechanism and its purpose to occur in the flower. Also, name the plant in which it occurs.

33. Explain the role of the following in the body defenses:
(i) Antihistamine (ii) Plasma cells (iii) Helper T cells

OR

(a) How can microbes be useful in production of beverages?
(b) Name a green manure crop? How does it help in increasing fertility of soil?

SOLUTIONS

1. The two common methods of apomictic development are recurrent agamospermy and adventive embryony.

2. Endothecial cells - 2n
Tapetal cells - Most of the mature tapetal cells are multinucleate and are polyploid.
Cells of sporogenous tissue - 2n
Cells of microspore tetrads or microspores - n

3. Milk production is stimulated by hormone prolactin and ejection of milk is stimulated by oxytocin.

4. P → Promoter
Q → Coding strand

5. The skin colour of human is controlled by three genes where the dominant alleles have cumulative effect. Each dominant allele expresses a part or unit of the trait (skin colour). Such type of genes are called polygenes and their inheritance is called as polygenic inheritance. So, the skin colour of human is a polygenic trait.

6. During gamete formation a diploid germinal cell changes to a haploid germ cell. Hence, a pair of autosomes get segregated by means of meiotic division to produce haploid gametes.

7. RNA is more reactive in comparison to DNA because:
(i) 2′ –OH group present in ribose sugar of every nucleotide of RNA is a reactive group. It makes RNA highly reactive, labile and easily degradable.
(ii) RNA functions as an enzyme, therefore is reactive and unstable.

8. Three types of restriction endonucleases are type I, type II and type III. Only type II restriction enzymes are used in *r*DNA technology.

9. *Brassica napus*

10. The biological interaction between sucker fish and shark is an example of commensalism.

11. (d) : Gene therapy is the technique of genetic engineering to replace a faulty gene by a normal healthy functional gene. ADA deficiency can be cured by bone marrow transplantation and by enzyme replacement therapy, but in both approaches the patients are not completely cured. However, if the isolated gene from bone marrow cells producing ADA is introduced into cells at early embryonic stages, it can be a permanent cure.
The lymphocytes are not immortal. They have a life span, hence with the formation of new lymphocytes, the patient requires the periodic infusion of genetically engineered lymphocytes.

OR

(b) : Polymerase chain reaction (PCR) is a technique of synthesising multiple copies of the desired gene *in vitro*. It can detect low amounts of DNA. For the early diagnosis of HIV in suspected AIDS patients, PCR is routinely used.

12. (d) : Tapetum is of two types - amoeboid and secretory. In amoeboid type, the tapetal cells fuse to form a plasmodium or periplasmodium because it passes in between the sporogenous cells to nourish them. The cells of secretory tapetum pass out substances over the sporogenous cells for their growth and differentiation.

13. (d) : In Arctic tern, seasonal migration occurs for avoiding stressful and inhospitable seasons like winter. It nests in North Pole during summer but flies to Antarctica during autumn to return to North pole during spring.

14. (d)

15. (i) (a) : Genetic diversity is the diversity in the number and types of genes as well as chromosomes present in different species and the variations in the genes and their alleles in the same species. India has more than 50,000 genetically diverse varieties of rice and 1000 varieties of mango.

(ii) (c) : Beta diversity is biodiversity which appears in a range of communities due to replacement of species with the change in community/habitat due to presence of different microhabitats, niches and difference in environmental conditions.

(iii) (b)

(iv) (d) : Diversity *Y* is species diversity. It is related to number and distribution of species found in an area. It is trait of the community. It influences biotic interaction and stability of the community.

(v) (a)

16. (i) (a) : Pitch of helix per turn is 34Å or 3.4 nm.

(ii) (d)

(iii) (c) : W.T. Astbury had found the structure of DNA through X-ray diffraction. Two chains of DNA are antiparallel to each other, DNA shows semi-conservative replication.

(iv) (b)

(v) (a)

17. A bilobed dithecous anther consists of four microsporangia. In the given case, each microsporangium contains 50 pollen mother cells (PMCs), therefore total 200 PMCs will be present in this anther. As each PMC produces 4 pollen grains which develop into 4 male gametophytes, therefore, pollen grains or male gametophytes produced by this anther will be 800 (=200 × 4).

18. According to the Wobble hypothesis, only the first two positions of a triplet codon on *m*RNA have a precise pairing with the base of the *t*RNA anticodon. The pairing of the third position basis of the codon may be ambiguous and varies according to the nucleotide present in this position. Thus, a single *t*RNA type is able to recognise two or more codons differing only in the third base (wobble position).

19. Cyclosporin A is an eleven membered cyclic oligopeptide obtained through fermentive activity of fungus *Trichoderma polysporum*. It has antifungal, anti-inflammatory and immunosuppressive properties. It inhibits activation of T cells and therefore prevents rejection reactions in organ transplantation.

20. Rosie is the first transgenic cow which produces human protein enriched milk. The milk contains human alpha-lactalbumin. This milk is nutritionally more balanced for human babies than natural cow milk.

21. (a) A bioreactor is a vessel in which raw materials are biologically converted into specific products by microbes, plant and animal cells and their enzymes. It provides optimal growth conditions (temperature, pH, substrate, salt, vitamins, oxygen) to the microbes for the synthesis of desired product.
Advantage of bioreactor is that it is well suited for large-scale production of microorganisms under aseptic conditions for a number of days. A major drawback or disadvantage of bioreactor is that it is relatively expensive to run it.

(b) The most commonly used bioreactors are of stirring type and these are of two types :
(i) Simple stirred - tank bioreactor
(ii) Sparged stirred - tank bioreactor

OR

If a cloning vector does not have a selectable marker, then it would not be possible to distinguish between transformants (host bacterium having rDNA) and non-transformants. Therefore, an ideal cloning vector should have selectable markers for the selection of transformants.

22. Palindromes are groups of letters that form the same words when read both forward and backward, *e.g.*, "MALAYALAM". As against a word-palindrome where the same word is read in both directions, the palindrome in DNA is a sequence of base pairs that reads same on the two strands when orientation of reading is kept the same. For example, the following sequences read the same on the two strands in 5′ → 3′ direction. This is also true if read in the 3′ → 5′ direction. In this case, it is
5′ — GAATTC — 3′
3′ — CTTAAG — 5′.

OR

Cohen and Boyer contributed to the field of biotechnology by constructing the first recombinant DNA molecule in 1972. They cut the piece of DNA from a plasmid carrying antibiotic resistance gene in *Salmonella typhimurium*. This piece of foreign DNA, was linked with the plasmid DNA, acting as a vector with the help of enzyme DNA ligase and introduced into *E. coli*.

23. Ganja is obtained from *Cannabis sativa*. It is hallucinogenic. It alters thoughts, feelings and perceptions and causes illusions.

24. Mycorrhiza is a mutually beneficial or symbiotic association of a fungus with the roots of a higher plant. The most common fungal partners of mycorrhiza are *Glomus* species. Mycorrhizal roots show a sparse or dense woolly growth of fungal hyphae on their surface. They perform several functions for the plant – (i) Absorption of water, (ii) Solubilisation of organic matter of the soil humus, release of inorganic nutrients, absorption and their transfer to root. (iii) Direct absorption of minerals from the soil over a large area and handing over the same to the root. Plants with ectomycorrhiza are known to absorb 2–3 times more of nitrogen, phosphorus, potassium and calcium.

(iv) The fungus secretes anti-microbial substances which protect the young roots from attack of pathogens.

25. Differences between parasitism and competition are as follows:

	Parasitism	**Competition**
(i)	It is relationship between two living organisms of different species in which one organism obtains food from another living organism.	It is rivalry between two or more organisms of same or different species for obtaining the same resources.
(ii)	*E.g.,* lice, an ectoparasite sucks blood of animals and *Trypanosoma*, an endoparasite feeds on body fluid.	*E.g.,* in forest areas, trees, shrubs, herbs and vines compete with each other for sunlight, nutrients, water, pollinators, etc.

Both parasitism and competition are negative population interactions. In parasitism, one organism (parasite) has negative effect on other organism (host) and in competition, both species are negatively affected.

26. (i) *P* and *Q* are copper releasing intrauterine devices (IUDs). P is CuT and Q is multiload 375.
(ii) *P* and *Q* are used as effective methods of birth control. They are inserted by doctors or expert nurses in the uterus through vagina. IUDs increase phagocytosis of sperms within the uterus and the Cu ions released by them suppress sperm motility and fertilising capacity of the sperms.

27. Incomplete dominance is the phenomenon in which neither of the two contrasting alleles of a gene is completely dominant over the other. Therefore, the expression of character controlled by the particular gene in F_1 individual is intermediate or fine mixture of the expression of two alleles. For *example* in *Mirabilis*, on crossing red flowered plants with white flowered plants, pink-flowered plants (intermediate) are obtained in F_1 generation. On selfing F_1 plants, all red, pink and white flowered plants appear in F_2 generation in the ratio of 1 : 2 : 1. The occurrence of parental characters in F_2 generation indicates that the alleles do not blend when present together in F_1 generation and therefore, segregate at the time of gamete formation. Hence, it cannot be considered a case of blending inheritance.

OR

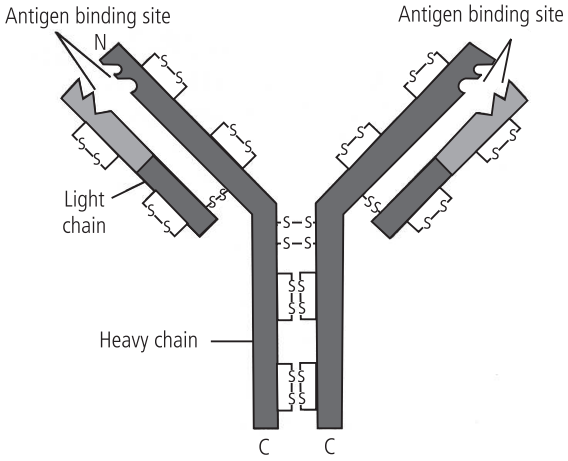
(i) P – Aa, Q – aa, R – Aa, S – aa, T – aa

(ii) The trait illustrated in the given figure is an autosomal recessive trait. It appears in case of marriage between two heterozygous individual (Aa × Aa), a recessive individual with hybrid (Aa × aa) and two recessive (aa × aa). For example, fused ear lobe, alkaptonuria, etc.

28. Parasitism is a negative interaction wherein parasite depends on its host organism partially or completely for survival and perpetuation. Accordingly, parasites are classified as partial or hemiparasites and complete or holoparasites. Also they could be ectoparasites (on host's body) or endoparasites (inside host's body). Parasites are adapted vividly on the basis of their dependability on host.
In accordance with their life styles, parasites evolved special adaptations such as:
(i) Anaerobic respiration in internal parasites
(ii) Loss of unnecessary sense organs
(iii) Presence of adhesive organs (*e.g.,* suckers in tapeworm) to cling on to the host
(iv) Loss of certain organs (*e.g.*, bedbugs lack wings, *Taenia* loses digestive system)
(v) Excessive multiplication
(vi) Resistant cysts and eggs for safe transfer of their progeny to new hosts
(vii) High reproductive capacity.

29. (a) Proinsulin has A, B and C polypeptide strands. It is non-functional. The mature insulin has only A and B polypeptide strands and it is functional.
(b) From the human cell, DNA containing insulin gene is isolated. The two DNA sequences corresponding to A and B chains of human insulin is introduced into the plasmids of *E. coli* to produce insulin chains A and B. The extracted chains A and B are combined by creating disulphide bonds to form human insulin (humulin).
(c) The insulin prepared by *r*DNA technology does not produce sensitive allergic reactions and immunological reactions. Those insulin used earlier, produced allergic reactions and other complications to the foreign protein as earlier insulin were extracted from pancreas of slaughtered cattle and pigs.

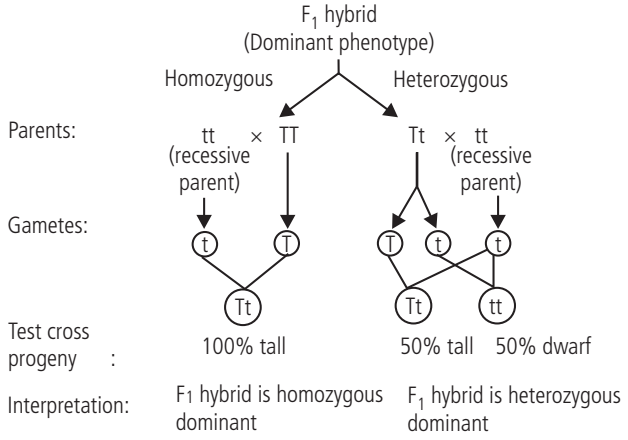
30. (a) The labelled diagram of an antibody molecule is as follows:



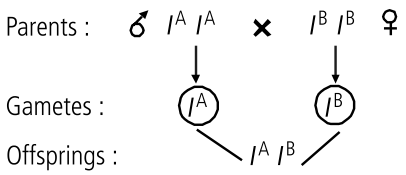
(b) IgE type of antibody is produced during allergic reaction.

31. (a) Crossing of F_1 individuals having dominant phenotype with its homozygous recessive parent is called test cross. The test cross is used to determine whether the individuals exhibiting dominant character is homozygous or heterozygous.

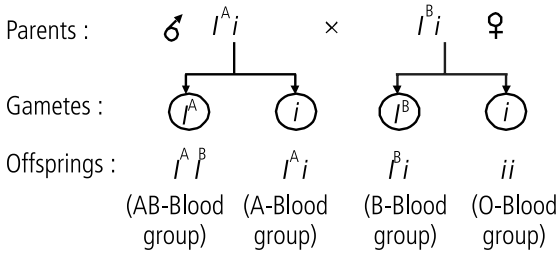
For example, when a tall plant is crossed with dwarf plant, only tall plants appear in F_1 generation. F_1 tall plant is then crossed with homozygous recessive (tt) parent in a test cross as shown below.



(b) If the father has blood group 'A' *i.e.*, I^AI^A (homozygous) and mother has blood group 'B' *i.e.*, I^BI^B then all the offsprings will have blood group 'AB' (I^AI^B) and not blood group 'O' as shown below.



Child will have blood group 'O' only when both the parents are heterozygous, *i.e.*, father I^Ai and mother I^Bi.



Thus the genotypes of the parents of child with blood group 'O' will be I^Ai and I^Bi. There is possibility of 3 other types of genotypes in offsprings. They are I^Ai (blood group A), I^Bi (blood group B) and I^AI^B (blood group AB).

OR

(a) Sutton and Boveri proposed chromosomal theory of inheritance in 1902. The salient features of this theory are :

(i) Chromosomes are vehicles of hereditary information and possess mendelian factors or genes.

(ii) It is the chromosomes, which segregate and assort independently, during transmission from one generation to the next.

(b) If two loci are linked (*i.e.* alleles are located closely on the same locus of a chromosome), there would be no segregation (assortment) of alleles or traits due to complete linkage. Therefore, the distribution of phenotypic features in F_1 generation will be similar to that of the parents. The law of independent assortment, involving inheritance of two traits together, occurs only under two conditions :

(i) When genes of different traits are located on different chromosomes.

(ii) If genes of different traits are located on the same chromosome, they must be located distantly to allow crossing over.

32. (i) P – Trophoblast, Q-Uterine epithelium, R – Blastocoel, S – Inner cell mass, A – Amniotic cavity

(ii) The cells of inner cell mass gets differentiated into two layers around 8 days after fertilisation, *i.e.*, C-hypoblast (primitive endoderm) and B-epiblast (primitive ectoderm). The cells of these two layers form a two layered embryonic disc. The inner cell mass has stem cells which have the potential to form all tissues and organs. These stem cells give rise to embryonic disc.

(iii) Implantation is anchoring or embedding of the blastocyst into endometrium of uterus. It begins about

seventh day after fertilisation of ovum (generally between 6^{th} and 9^{th} days after fertilisation). It takes about three days for the process to be completed. The blastomeres in the blastocyst are arranged into an outer layer called trophoblast and an inner group of cells attached to trophoblast called the inner cell mass. The trophoblast layer then gets attached to the endometrium and the inner cell mass gets differentiated as the embryo. After attachment, the uterine cells divide rapidly and covers the blastocyst. As a result, the blastocyst becomes embedded in the endometrium of the uterus. This whole phenomenon is called implantation and it leads to pregnancy.

OR

(i) The structures P, Q and R in the flower A are closed stigma, sterile anther lobe and fertile anther lobe, respectively. The given flower is protandrous flower with bilobed corolla.

(ii) The structure S is stigma of flower B. It receives pollen grain from the back of insect that has brought the pollen grains from flower A.

(iii) The mechanism that operates in the flower is turn-pipe or lever mechanism. It operates to promote cross pollination. It occurs in *Salvia*.

33. (i) Antihistamine is a drug that inhibits the action of histamine in the body by blocking either of two types of receptors for histamine, H_1 or H_2. When stimulated by histamine, H_1 receptors may produce such allergic reactions as hay fever, pruritus (itching), and urticaria (nettle rash). Antihistamines that block H_1 receptors (H_1-receptor antagonists) are used to relieve these conditions.

(ii) Plasma cells are antibody-producing cells found in blood forming tissues and also in the epithelium of the lungs and gut. They develop in the bone marrow, lymph nodes and spleen when antigens stimulate B-lymphocytes to produce the precursor cells that give rise to them.

(iii) Helper T cell is a type of T-lymphocyte that plays a key role in cell-mediated immunity. They produce a growth factor that stimulates B-cell proliferation and differentiation and also stimulates antibody production by plasma cells. Helper T-cells also enhance activity of cytotoxic T-cells.

OR

(a) Microbes especially yeasts, have been used from time immemorial for the production of beverages like wine, beer, whisky, brandy or rum. Yeast *Saccharomyces cerevisiae* used for bread-making and commonly called brewer's yeast, is used for fermenting malted cereals and fruit juices, to produce ethanol. Depending on the type of the raw material used for fermentation and the type of processing (with or without distillation) different types of alcoholic drinks are obtained. Wine and beer are produced without distillation, whereas whisky, brandy and rum are produced by distillation of the fermented broth.

(b) A green manure crop is *Crotolaria juncea*. The plants are leguminous which possess root nodules where atmospheric nitrogen is fixed by *Rhizobium* bacteria. Therefore, these plants enrich the soil by supplying fixed nitrogen, organic matter and other nutrients.

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