

SAMPLE Question Paper 10

(Questions-Answers)*

BIOLOGY

*A Highly Simulated Practice Question Paper for
CBSE Class XII Examination*

Time : 3 hrs

Max. Marks : 70

General Instructions

1. All questions are compulsory.
2. The question paper has four sections: Section A, Section B, Section C and Section D. There are 33 questions in the question paper.
3. Section-A has 14 questions of 1 mark each and 2 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.
4. 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.
5. Wherever necessary, neat and properly labelled diagrams should be drawn.

SECTION A

(7 Mark)

1. What are monoclonal antibodies?
2. Which one of an intron and an exon is the reminiscent of antiquity?
3. Name an IUD that you would recommend to promote the cervix hostility to sperms.
4. Mention the function of trophoblast in human embryo.
5. Define biodiversity.
6. Name the scientist who constructed the first recombinant DNA.
7. Give the roles of immune system.
8. In double helix model of DNA, how far is each base pair from the next base pair?
9. How is the ongoing 'sixth extinction' different from the previous episodes?
10. Name the source of cannabinoids. Also name two drugs belonging to this class.

* You are advised to attempt this sample paper without referring the explanations given here. However, cross check your explanations with the explanations given at the end of paper after you complete the paper.

Direction (Q. Nos. 11-14)

In each of the following questions, a statement of Assertion (A) is given followed by corresponding statement of Reason (R). Of the statements, mark the correct answer as

- (a) If both A and R are true and R is the correct explanation of A
- (b) If both A and R are true, but R is not the correct explanation of A
- (c) If A is true, but R is false
- (d) If both A and R are false

11. Assertion (A) The process of oogenesis is markedly different from spermatogenesis.

Reason (R) Oogenesis is initiated during the embryonic development stage when million gemete mother cells (oogonia) are formed in each fetal ovary.

12. Assertion (A) Mendelian disorders are transmitted to offspring on the same lines as in the principles of inheritance.

Reason (R) The pattern of inheritance of Mendelian disorders cannot be traced in a family by the pedigree analysis.

Or

Assertion (A) Synthesis of mRNA takes place in 5' → 3' direction.

Reason (R) mRNA is read always in 3' → 5' direction.

13. Assertion (A) 99% of animals and nearly all plants are conformers.

Reason (R) During the course of evolution, the costs and benefits of maintaining a constant internal environment are taken into consideration.

14. Assertion (A) India is one of the 12 mega diversity countries of the world.

Reason (R) India has only 2.4% of world's land area, but its share of the global species diversity is an impressive 8.1%.

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

Mendel is known as the 'father of genetics' because of his ground breaking work on inheritance in pea plants 150 years ago. At the age of 21 Mendel while working in a monastery in Brunn (now in the Czech Republic) began a series of experiments in their botanical garden. He found out how traits are passed from one generation to another, i.e. inheritance. He studied this in peas (*Pisum sativum*), because they are easy to grow and can be shown each year.

- (i) Which one from those given below is the period of Mendel's hybridisation experiments?
 - (a) 1856-1863
 - (b) 1840-1850
 - (c) 1857-1869
 - (d) 1870-1877
- (ii) How many pairs of true breeding varieties were selected by Mendel for his experiment on pea plant?
 - (a) 12
 - (b) 13
 - (c) 14
 - (d) 15
- (iii) Among the following characters which one was not considered by Mendel in his experiments on pea?
 - (a) Stem-Tall or Dwarf
 - (b) Trichomes-Glandular or Non-glandular
 - (c) Seed-Green or Yellow
 - (d) Pod-Inflated or Constricted
- (iv) Which is correct about traits chosen by Mendel for his experiments on pea plant?
 - (a) Terminal pod was dominant
 - (b) Constricted pod was dominant
 - (c) Green coloured pod was dominant
 - (d) Tall plants were recessive
- (v) **Assertion** (A) True breeding lines have stable trait inheritance for several generations.

Reason (R) Mendel conducted cross-pollination experiments on true breeding lines.

 - (a) If both A and R are true and R is the correct explanation of A
 - (b) If both A and R are true, but R is not the correct explanation of A
 - (c) If A is true, but R is false
 - (d) If both A and R are false

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

Drugs abuse and addiction now both grouped as substance or drug use disorder is a condition characterised by a self destructive pattern of using a substance that leads to significant problems and distress, which may include tolerance to or withdrawal from the substance. The effect of drugs on the brain can some what vary depending on the drug that is being used. Drugs particularly effect the brain's ability to inhibit actions that the person would otherwise delay or prevent. Drug addiction increases the risk of a number of negative life stressors and conditions, particularly if left untreated.

- (i) Drugs that are normally used as medicines to help the patients cope with mental illness are
- barbiturates
 - amphetamines
 - benzodiazepines
 - All of these
- (ii) LSD is derived from
- Claviceps purpurea*
 - Pseudomonas putida*
 - Cannabis indica*
 - Cannabis sativa*
- (iii) Nicotine intake stimulates the release of hormones known as

- adrenaline and nor-adrenaline
- thyroxine and parathyroxine
- oestrogen and progesterone
- All of the above

(iv) Which one of the following fungi-contains hallucinogens?

- Morchella esculenta*
- Amanita muscaria*
- Neurospora* sp.
- Ustilago* sp.

(v) A type of drug is obtained from the plant whose one flowering branch is shown below.



Choose the correct option regarding the figure.

- It is a hallucinogen.
 - It is a stimulant.
 - It produces euphoria and increased energy.
 - It induced behavioural abnormalities by changing thoughts, feelings and perceptions.
- I and III
 - II and IV
 - I and IV
 - II and III

SECTION B

(2 Marks)

17. The distance between genes A and B is 20 Map units, genes B and C is 10 Map units while between genes A and C it is 30 Map units.

Based on the above information, construct a linkage map and find out the possible order of the genes A, B and C in the map.

18. Draw a well-labelled structure of a typical antibody molecule.

19. Gynoecium of a flower may be apocarpous or syncarpous. Explain with the help of an example each.

Or

How is parthenogeny and parthenocarpy different from each other?

20. Why is pedigree analysis done in the study of human genetics? State the conclusions that can be drawn from it.

21. Write in brief the three types of RNAs.

22. Discuss about the causative agent, transmission and symptoms of ascariasis.

Or

Name the source of cyclosporin-A. How does this bioactive molecule function in our body?
 23. State the role of UV-light and ethidium bromide during gel electrophoresis of DNA fragments.

24. (i) What are the advantages of condoms?
 (ii) On what principle do the natural methods of birth control work?
 25. State any four methods to overcome infertility in human couples.

SECTION C

(3 Marks)

26. What are lymphoid organs? Write the names of any four lymphoid organs along with their functions.

Or

What is cancer? How do normal cells get transformed into cancerous neoplastic cells? Mention any one difference between viral oncogenes and cellular oncogenes.

27. cry I Ac and cry II Ab are introduced in a plant to prevent infestation by cotton bollworms.

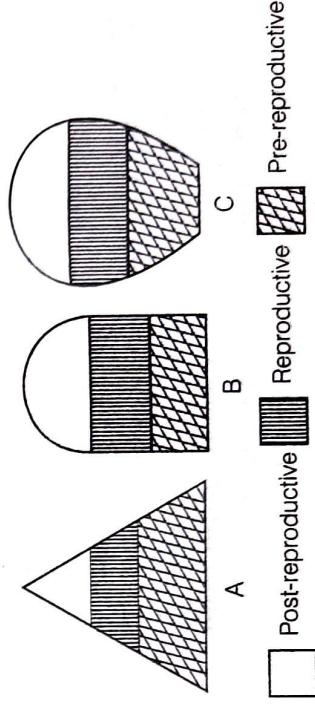
- (i) What would be the result of this process?
 (ii) Summarise the action of this gene in the host it is introduced into.

28. In some children, ADA (Adenosine Deaminase) deficiency can be cured by bone marrow transplantation and in other enzyme replacement therapy can be opted alternatively. However, both these approaches are not completely curative. Suggest an alternate method to improve the approach towards a more permanent cure.

29. Give reason for the following.

- (i) Plasmid is an important tool in biotechnology experiments.
 (ii) Biotechnologist refer *Agrobacterium tumefaciens* as a natural genetic engineer of plants.
 (iii) It is essential to have a selectable marker in a cloning vector.

30. Population at any given time is composed of individuals in different age groups. Given below are the diagrams of age pyramids for different populations. Analyse these pyramids and comment on the status of population they could be associated with.



Handwritten notes: 30 mark, 10 A, 10 B, 10 C

SECTION D

(5 Marks)

31. (i) Describe the characteristic features of anthers, pollen and stigma of wind pollinated flowers.

(ii) What is meant by heterostyly and dioecy? Why some cross-pollinated plants develop such adaptations?

the three inter-related hierarchical levels of diversity.

Or

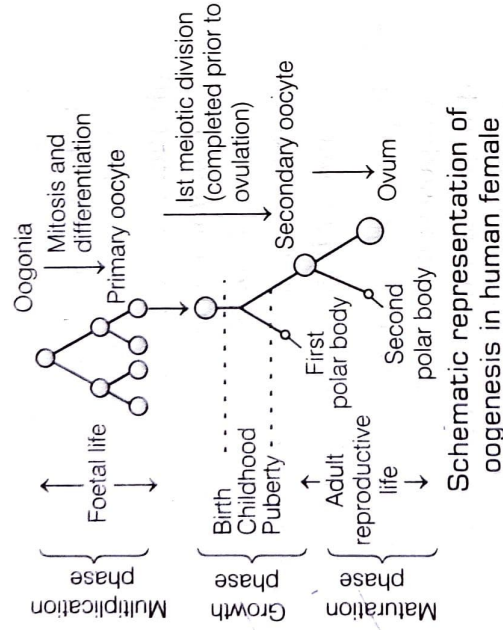
Recognise the type of interaction in the figure and answer the questions as follows.



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Or

(i) Given a schematic representation of oogenesis in humans.



Mention the number of chromosomes at each stage. Correlate the life phases of the individual with the stages of the process.

(ii) A woman passes out hCG in the urine during pregnancy, why?

32. The term 'biodiversity' is used to describe the diversity at all levels of biological organisation ranging from macromolecules inside the cells to biomes. Assess and compile a report on

(i) Identify the given interaction depicted in the figure above and explain it.

(ii) How would extinction or change of one effect the other?

33. (i) Discuss and work out Mendel's monohybrid cross up to F_2 -generation by giving an example of seed colour as a trait in *Pisum sativum*.

(ii) State the law of inheritance which can be derived from such a cross.

(iii) How is the phenotypic ratio of F_2 -generation of monohybrid cross different from that of dihybrid cross?

Or

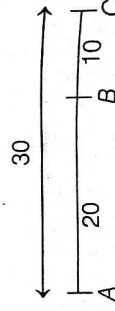
The pattern of inheritance of ABO blood group is known to exhibit dominance, codominance and multiple allelism. Explain each concept with the help of blood group genotypes.

EXPLANATIONS

1. Monoclonal antibodies are identical immunoglobulins, generated from a single B-cell. They recognise unique binding sites on a single antigen. (1)
2. Intron is considered to be the reminiscent of antiquity. (1)
3. The hormone releasing IUDs, e.g. progestasert and LNG-20 are recommended to promote the cervix hostility to sperm. (1)
4. Trophoblast is the outer layer of blastocyst which helps in attachment of blastocyst to the endometrium of uterus. (1)
5. Biodiversity can be defined as the occurrence of different types of genes, gene pools, species, habitats and ecosystem in a given region at a given time. (1)
6. The first recombinant DNA was constructed by Stanley Cohen and Herbert Boyer. (1)
7. Immune system plays an important role in
 - I. Recognition of foreign antigens
 - II. Responds to antigens and remembers them
 - III. Allergic reactions
 - IV. Organ transplantation
 (1)
8. 0.34 nm (1)
9. The current species extinction rate is estimated to be 100-1000 times faster than the extinctions in the prehuman era. (1)
10. Cannabinoids are obtained from the inflorescence of *Cannabis sativa*. Marijuana and hashish are cannabinoid drugs. (1)
11. (a) The process of oogenesis is markedly different from spermatogenesis. Oogenesis is initiated during the embryonic development stage when million of oogonia are formed. In contrast, spermatogenesis begins at puberty. Thus, both A and R are true and R is the correct explanation of A. (1)
12. (c) Mendelian disorders are transmitted to offspring on the same lines as in the principles of inheritance. The pattern of inheritance of Mendelian disorders can be traced in a family by the pedigree analysis. Thus, A is true, but R is false. (1)

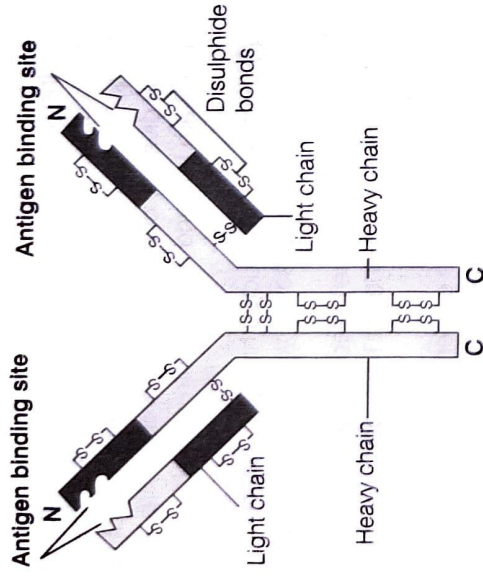
Or

 (c) Synthesis of mRNA takes place in 5' → 3' direction because reading of mRNA is carried out in 5' → 3' direction. Thus, A is true, but R is false. (1)
13. (a) 99% of animals and nearly all plants are conformers as during the course of evolution, the costs and benefits of maintaining a constant internal environment are taken into consideration. Thus, both A and R are true and R is the correct explanation of A. (1)
14. (a) India has only 2.4% of world's land area. India share of the global species diversity is an impressive 8.1%. That is what makes our country one of the 12 mega diversity countries of the world. Thus, both A and R are true and R is the correct explanation of A. (1)
15. (i) (a) Mendel conducted his hybridisation experiments for seven years between 1856-1863. (1)
- (ii) (c) 14 pairs of true breeding varieties were selected by Mendel for his experiment on pea plant. (1)
- (iii) (b) Trichomes are epidermal tissue structure. These were not among the seven pairs of characters chosen by Mendel. (1)
- (iv) (c) Green coloured pod was dominant over yellow coloured pod in Mendel's experiments. (1)
- (v) (b) True breeding lines show inheritance of pure characters for several generations. This is because true breeding lines are homozygous for the traits. Therefore, Mendel conducted cross-pollination experiments between different true breeding lines to study the concept of inheritance. (1)
- Thus, both A and R are true, but R is not the correct explanation of A. (1)
16. (i) (d) Drugs like barbiturates, amphetamines, benzodiazepines, LSD and other similar drugs are normally used as medicines to help patients cope with mental illness like depression and insomnia. (1)
- (ii) (a) Lysergic Acid Diethylamide (LSD) is an extremely potent psychedellic ergot alkaloid derived from fungus *Claviceps purpurea*. (1)
- (iii) (a) Nicotine acts on the adrenal gland to stimulate the release of adrenaline and nor-adrenaline into the blood circulation. (1)
- (iv) (b) *Amanita muscaria* is a fungus which is known for containing hallucinogenic properties. (1)
- (v) (c) Statements I and IV are correct as the plant shown in the given picture is *Datura*, which produces natural hallucinogens. These drugs induce behavioural abnormalities by changing thoughts, feelings and perceptions without any actual sensory stimulus. (1)
17. If we assume that gene B is present in the middle of A and C, then the correct order of genes A, B and C is



This arrangement satisfies all the stated conditions, i.e.
 A – B = 20 Map units, B – C = 10 Map units
 A – C = 30 Map units (2)

18.



Structure of an antibody (2)

19. Gynoecium of a flower is called as apocarpous when the carpels are free, e.g. apocarpous in *Ranunculus*. Whereas it is called syncarpous, when the carpels are fused, e.g. syncarpous in *Petunia*. (2)

Or

Both parthenogeny and parthenocarpy differ to development of organism without undergoing fertilisation. But parthenocarpy is related to fruits, as fruits formed without fertilisation are parthenocarpic fruits and parthenogeny is related to animals. Thus animals like rotifers or honeybees, when formed without fertilisation rather formed due to development in female gamete is called parthenogenetic animal. (2)

20.

The study of inheritance of genetic traits in several generations of a human family in the form of a family diagram is called pedigree analysis. Inheritance pattern of traits in human beings cannot be studied by crosses.

Thus, pedigree analysis is done. It provides a strong tool, which is utilised to trace the inheritance of a specific trait, abnormality or disease. (2)

21.

There are following three types of RNAs, viz.

- (i) mRNA (messenger RNA) provides the template for transcription.
- (ii) tRNA (transfer RNA) brings amino acids and reads the genetic code.
- (iii) rRNA (ribosomal RNA) plays structural and catalytic role during translation.

All the three RNAs are needed to synthesise proteins in a cell. (2)

22.

Causative Agent Ascariasis is caused by an intestinal endoparasite of human, *Ascaris lumbricoides*, which is commonly called as roundworm.

Transmission Infection occurs as the eggs of parasite are excreted along with the faeces of infected person, which contaminate water, soil, plants, etc.

Symptoms These include abdominal pain, indigestion, muscular pain, fever, anaemia, nausea, headache and blockage of intestinal passage. (2)

Or

Cyclosporin-A is produced by the fungus *Trichoderma polysporum*. It is used as an immunosuppressive agent in organ transplant patients as it suppresses the activation of T-cells in body. (2)

23.

DNA fragments are observed only after staining with ethidium bromide followed by their exposure to UV radiation. This gives bright orange colour to DNA fragments. (2)

24.

(i) Condoms act as barriers to prevent the meeting of the sperm and the ovum to prevent conception. These also prevent the spread of STDs. (1)

(ii) Natural methods of birth control work on the principle of avoiding the chances of the meeting of the sperm and ovum, so as to prevent fertilisation. (1)

25.

Following are the four methods to overcome infertility problems in human couples

- (i) Test tube baby programme
- (ii) Intra Cytoplasmic Sperm Injection (ICSI)
- (iii) Artificial Insemination Technique (AIT)
- (iv) Gamete Intra Fallopiian Transfer (GIFT)

Lymphoid organs are those organs where maturation and proliferation of lymphocytes take place. The four lymphoid organs and their functions in human body are as follows

(i) **Bone Marrow** It is a major lymphoid organ where all blood cells, including lymphocytes are formed. It is the site of B-lymphocyte maturation.

(ii) **Thymus** It is a lobed organ located near the heart and beneath the breastbone. T-lymphocytes mature in thymus and are responsible for both cellular and humoral immune response.

(iii) **Spleen** It is a large bean-shaped organ comprising of single mass of lymphoid tissues. In foetal stage, it produces all types of blood cells, but in adult stage, only lymphocytes are produced. It filters the blood by trapping the blood borne microorganism.

(iv) **Lymph Nodes** These are small solid structures composed of lymphoid tissue. They produce lymphocytes and plasma cells and also act as filters to trap microorganisms or other antigens that enter the lymph and tissue fluid. (3)

Or

Cancer is defined as an abnormal and uncontrolled proliferation of cells without any differentiation. These cells invade and destroy the surrounding tissues. (1)

Differentiation of Normal Cells into Cancer Cells

Normal cells show a property called contact inhibition. Due to this property, upon contact other cells their uncontrolled growth is inhibited. Cancer cells lose this property.

These cells do not respond to normal growth control mechanism and proliferate in an unregulated manner to form a mass of cells with uncontrolled growth called tumour or neoplasm. (1)

Difference between viral oncogenes and cellular oncogenes is as follows

Viral Oncogenes Cellular Oncogenes

Genes of viruses which cause cancer.	Genes present in normal cells, which become activated under certain conditions and cause oncogenic transformation of the cell.
--------------------------------------	--

(1)

27. (i) By introducing *cry IAc* and *cry IIAb* genes, the host will become resistant to infestation by bollworms, e.g. *Bt* cotton. (1)

(ii) The *Bt* gene derived from the bacterium *Bacillus thuringiensis* codes for the Cry protein, which normally exists in an inactive form. As soon as the target insect feeds on the *Bt* cotton, the toxic protein produced in the plants, gets converted into its active form due to alkaline pH of the gut of insect.

The activated protein then binds to the surface of insect's midgut and creates pores that cause swelling, lysis and eventually death of the insect. (2)

28. The alternate method gene therapy was introduced to cure ADA deficiency.

Steps undertaken in gene therapy are

- (i) First, the lymphocytes from the blood of the patient are extracted and grown in a culture outside the body.
- (ii) A functional ADA, cDNA (using a retroviral vector) is then introduced into these lymphocytes, which are subsequently returned to the patient.
- (iii) As these cells are not immortal, the patient requires periodic infusion of such genetically engineered lymphocytes.
- (iv) For a more permanent approach towards treatment, the gene isolated from bone marrow cells producing ADA can be introduced into cells at early embryonic stages. (3)

29. (i) Plasmid have the ability to replicate within bacterial cells independent of chromosomal DNA. They have high copy number, therefore an alien

DNA ligated to it, will have equal copy number of plasmid. Thus, it used as a vector in biotechnology experiments. (1)

(ii) *Agrobacterium tumefaciens* is a pathogen of several dicot plants. It is able to deliver a piece of its DNA to transform normal plant cells into tumour cells and direct the tumour cells to synthesise chemicals required by the pathogens. Thus, called natural genetic engineer. (1)

(iii) Selectable marker in cloning vector helps in identifying and selecting the recombinants and eliminating the non-recombinants. (1)

30. **Figure A** It is 'pyramid'-shaped. In this figure, the base, i.e. pre-reproductive stage is very large as compared to the reproductive and post-reproductive stages of the population.

This type of age structure indicates that the population would increase rapidly. (1)

Figure B It is an 'inverted bell-shaped pyramid. In this figure, the pre-reproductive and reproductive stages are same. This type of age structure indicates that the population is stable. (1)

Figure C It is an urn-shaped pyramid. In this figure, the pre-reproductive and reproductive stages are less than the post-reproductive stages of this population. In this population, more older people are present. This type of age structure indicates that the population is declining. (1)

31. (i) Characteristic features of wind pollinated flowers are as follows

- The anthers are well-exposed for the easy dispersal of pollen grains.
- Pollen grains are small, light, dry, dusty, non-sticky and sometimes even winged.
- The stigmas are large, hairy and feathery or branched to catch the airborne pollen grains.
- Flowers are small, colourless, inconspicuous and nectarless.
- Wind pollinated flowers often have a single ovule in each ovary and numerous flowers packed into an inflorescence like in tassels of a corn cob. (2)

(ii) **Heterostyly** In some plant species, the anther and stigma are placed at different positions, so that the pollen cannot come in contact with the stigma of same flower. This condition is called heterostyly. It prevents autogamy.

Dioecy In some plants, male and female flowers are present on different plants, i.e. each plant is either male or female. It is known as dioecy, e.g. papaya. It prevents both autogamy and geitonogamy.

Cross-pollinating plants develop such devices to discourage self-pollination and encourage

cross-pollination as continued self-pollination leads to the chances of inbreeding depression. (3)

Or

(i) Oogenesis in humans is the formation of a mature female gamete. The process occurs in ovary and begins before birth, i.e. during embryonic development but completes when fertilisation occurs.

The chromosome number at each stage are as follows:

- (a) Oogonia – 46 chromosomes
- (b) Primary oocyte – 46 chromosomes
- (c) Secondary oocyte – 23 chromosomes
- (d) Ovum – 23 chromosomes

Similar to the life phases, oogenesis encompasses three basic phases, viz. growth phase, multiplication phase and maturation phase.

(a) **Multiplication Phase** The egg mother cell multiplies by mitosis to form oogonia which grow in the follicles.

(b) **Growth Phase** Oogonium grows into a large primary oocyte by obtaining nourishment from follicle cells.

(c) **Maturation Phase** Meiosis-I occurs during this phase. A large haploid oocyte and a small polar body is formed. (2)

(ii) The presence of human Chorionic Gonadotropin (hCG) is the basis of pregnancy test. Placenta formed during pregnancy secretes hCG, which is then released in the urine of a pregnant woman. (1)

32. Biodiversity refers to the variety and variability of living organisms on planet earth. The three inter-related hierarchical levels of the diversity are as follows

(i) **Genetic Diversity**

It is the diversity in the number and types of genes and chromosomes in different species.

A single species shows high diversity at the gene level. For example, there are more than 20,000 species of ants, 28,000 species of fishes, etc.

Greater the genetic diversity among organisms of a species, more sustenance it has against the environmental disturbances. Genetic diversity within the species creates different subspecies, variety, breed, forms, etc., e.g. India has more than 50,000 genetically different strains of rice and 1000 varieties of mango. (2)

(ii) **Species Diversity**

It is the measure of the variety of species and their relative abundance present within a region, e.g. Western ghats have more amphibian species than Eastern ghats.

Two important measures of species diversity are

(a) **Species Richness** It refers to the number of species per unit area. Species diversity increases, if the species richness is higher.

(b) **Species Evenness** It refers to the relative abundance of species in an area. The number of individuals and varieties determines the level of diversity of an ecosystem. (2)

(iii) **Ecological Diversity**

It refers to the diversity of different types of species present in the environment. It is also related to the genetic diversity at ecological level. Due to the presence of more variety of ecosystems and habitats, e.g. rainforest, desert, wetlands, mangroves, coral reefs, alpine meadows, etc., India has a greater ecological diversity than Scandinavian countries. (1)

Or

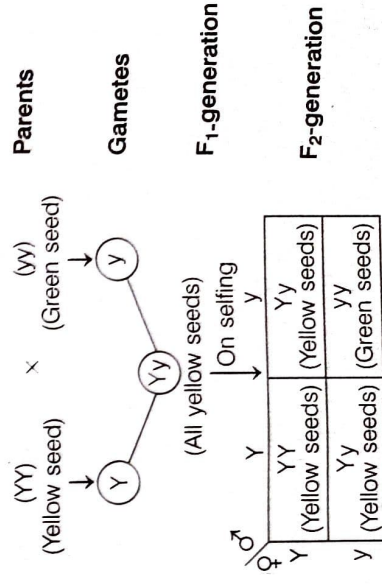
(i) Mutualism is an association seen between the bumble bee and the orchid (*Ophrys*). In this, both species are benefitted. One petal of its flower bears an uncanny resemblance to the female of the bee in size, colour and markings. The male bee is attracted to what it perceives as a female and pseudocopulates with the flower. During the process, the bee gets dusted with pollen from the flower. When this same bee pseudocopulates with another flower, it transfers pollen to it and thus, pollinates the flower. (2½)

(ii) Extinction of bumble bee will definitely affect the orchid flower because these bees are the means of pollination for the flower and if they get extinct the pollination percentage will be reduced. But, the extinction of the orchid will not affect the bumble bee population. (2½)

33. (i) In a monohybrid cross, when homozygous dominant and homozygous recessive parents are crossed in F₁-generation, all hybrids are obtained. These are heterozygous for a trait and express only dominant allele. This can be explained by crossing plants of *Pisum sativum* having yellow seeds (YY) and green seeds (yy).

Both are homozygous for their characters. In F₁-generation, all hybrid plants having yellow seeds are obtained.

On selfing in F₂-generation, yellow seed and green seed plants are obtained in 3 : 1 ratio.



Phenotypic ratio – 3 : 1 (Yellow : Green)

Genotypic ratio – 1 : 2 : 1

(2)

(ii) All plants of the F_1 -generation are heterozygous containing both the alleles for seed colour (i.e. Y and y) but only one trait, i.e. yellow colour appeared in the first generation. This shows that yellow seed colour is dominant over the green seed colour. This explains Mendel's law of dominance.

This law states that characters are controlled by discrete units called factors, which occur in pairs. In a dissimilar pair of factors, one member of the pair which expresses itself in F_1 -generation is dominant over the other, i.e. recessive. (2)

(iii) Phenotypic ratio in the F_2 -generation of monohybrid cross is different from that of dihybrid cross in the following ways

In monohybrid cross 3 : 1

In dihybrid cross 9 : 3 : 3 : 1

Or

In humans, ABO blood group is controlled by the gene I. The plasma membrane of the red blood cells has sugar polymers that protrude from its surface and the kind of sugar is controlled by the gene. The gene I has three alleles I^A , I^B and i.

The alleles I^A and I^B produce a slightly different form of the sugar while, allele i does not produce any sugar. In humans, each person possesses any two of the three I gene alleles.

Genetic Basis of Blood Groups in Human Population

Allele from Parent 1	Allele from Parent 2	Genotype of Offspring	Blood type of Offspring
I^A	I^A	$I^A I^A$	A
I^A	I^B	$I^A I^B$	AB
I^A	i	$I^A i$	A
I^B	I^A	$I^A I^B$	AB
I^B	I^B	$I^B I^B$	B
I^B	i	$I^B i$	B
i	i	ii	O

ABO blood group exhibits dominance, codominance and multiple allelism.

Dominance In this phenomenon, one allele expresses itself in the presence of other allele. The alleles I^A and I^B are dominant over allele i. The former two form antigen-A and antigen-B, respectively, whereas i do not form any antigen dominant over allele i. The former two form antigen, F_1 -generation resembles both the parents, whose characters are expressed

Codominance In this phenomenon, F_1 -generation resembles both the parents, whose characters are expressed simultaneously.

Alleles I^A and I^B are codominant as both of them are expressed in blood group AB by forming the antigen-A and B. (1)

Multiple Allelism It is the phenomenon of occurrence of a gene is more than two allelic forms on the same locus. The ABO blood group in humans is determined by three different allelic forms I^A , I^B and i. (1)