CBSE Class 12 Biology
Sample Paper 03 (2019-20)

Maximum Marks: 70
Time Allowed: 3 hours

General Instructions:

i. There are a total of 27 questions and five sections in the question paper. All questions are compulsory.
ii. Section A contains question numbers 1 to 5, multiple-choice questions of one mark each. Section B contains question numbers 6 to 12, short answer type I questions of two marks each. Section C contains question numbers 13 to 21, short answer type II questions of three marks each. Section D contains question number 22 to 24, case-based short answer type questions of three marks each. Section E contains question numbers 25 to 27, long answer type questions of five marks each.
iii. There is no overall choice in the question paper. However, internal choices are provided in two questions of one mark, one question of two marks, two questions of three marks and all three questions of five marks. An examinee is to attempt any one of the questions out of the two given in the question paper with the same question number.

Section A

1. Corpus luteum secretes

    a. Only progesterone

    b. LH

    c. Estrogens and Progesterone

    d. Progesterone and LH

OR

Surgical method of contraception

a. Prevent insemination and ovulation

b. All of the above

c. Prevents fertilisation

d. Prevents gamete formation

2. Alzheimer disease in humans is associated with the deficiency of

a. Dopamine

b. Gamma-aminobutyric acid (GABA)

c. Acetylcholine

d. Glutamic acid

OR

The disease-causing microorganisms are called

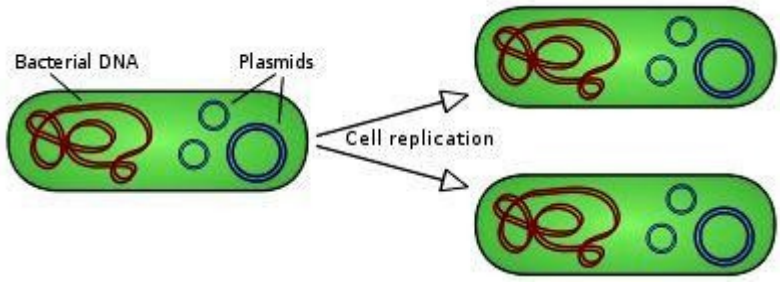
a. Fungi

b. Microbes

c. Pathogen

d. Allotropes

3. Which of the following is true for a Plasmid -



a. It can be replicate independently

b. It cannot replicate

c. It lies together with chromosomes

d. It shows independent assortment

4. If DNA is digested by EcoRI, it will lead to

   a. Multiple ori

   b. Sticky ends

   c. No antibiotic resistance

   d. Blunt ends

5. UNESCO launched biosphere reserve programme under its MAB in :

   a. 1970

   b. 1971

   c. 1960

   d. 1972

Section B

6. The number of taxa exhibiting asexual reproduction is drastically reduced in the higher plants (angiosperms) and higher animals (vertebrates) as compared with lower groups of plants and animals. Analyze the possible reasons for this situation.

OR

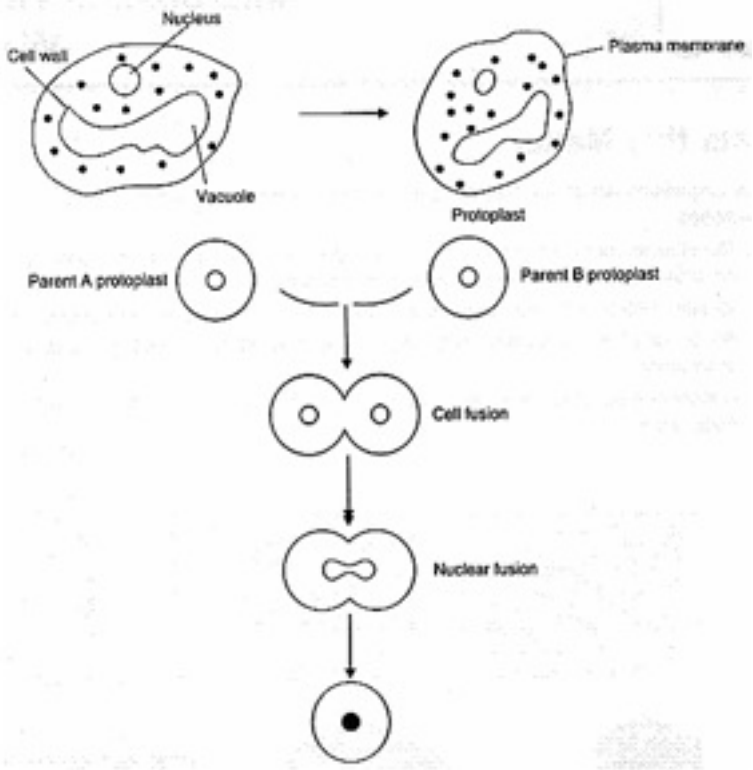
What is pollination? Name the different agencies of pollination.

7. What way the advent of the birth control pill have resulted in an increase in STDs?
8. What is a test cross? How does it differ from a reciprocal cross?
9. Read carefully the sequence of codons in the mRNA unit and answer the question:

   a. What change is needed in the first codon to start the translation process?

   b. If translation starts by that change, till which codon it can continuous? Why?

10. Figure given below represents a certain technique of tissue culture.



   i. Name the technique, as shown in the diagram.
   ii. What are the enzymes used to digest plant cell wall?
   iii. Name the fusinogen.
   iv. What is the product of the fusion of protoplasts?

11. Write the functions of
   i. cry IAc gene
   ii. RNA interference (RNAi)

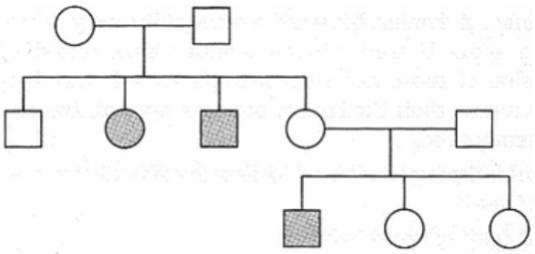
12. Construct a pyramid of biomass starting with phytoplankton. Label 3 trophic levels. Is the pyramid upright or inverted? Why?

Section C

13. i. Why does endosperm development precede embryo development in angiosperm seeds? State the role of endosperm in mature albuminous seeds.
   ii. Describe with the help of three labelled diagrams the different embryonic stages that include mature embryo of dicot plants.

14. i. Draw a labelled longitudinal view of an albuminous seed.
   ii. How are seeds advantageous to flowering plants?

15. Study the given pedigree chart and answer the questions that follow:

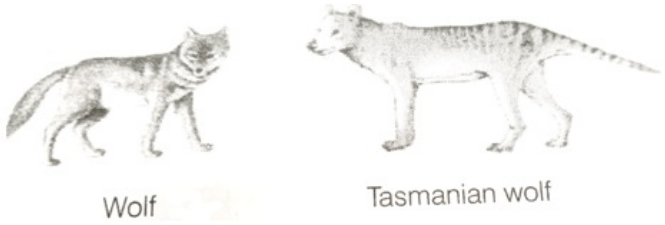


i. Is the trait recessive or dominant?
ii. Is the trait sex linked or autosomal?
iii. Give the genotypes of the parents in generation I and of their third and fourth child in generation II.

OR

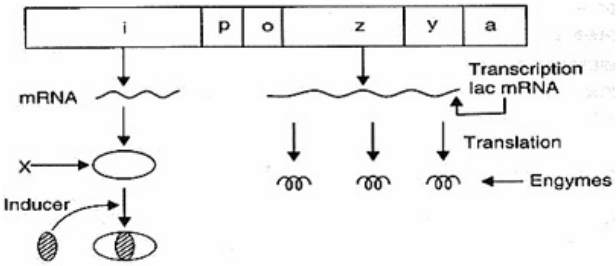
What do you understand by phenotype and genotype? Explain by giving an example.

16. Refer to the figure given below and answer the following questions



i. Identify the process by which Tasmanian wolf came into evolution.
ii. Define the process identify in (i).
iii. Apart from marsupials, this process was also observed in which other organism?

17. Study the figure given below and answer the following questions:



i. Name the molecule 'X' synthesized by 'i' gene. How does this molecule gets inactivated?
ii. Which one of the structural genes codes for β -galactosidase?
iii. When will the transcription of this gene stop?

18. Samir planned to introduce MOET in his farm. He purchased one high milk yielding exotic breed of cow. Within a few years he earned lot of money by selling calves but the mother cow met with a premature death. Raghavan objected to Samir earning money by this way.

i. What values in life did Raghavan possess?
ii. Expand MOET.
iii. Briefly describe the process.

19. i. Give the scientific name of the soil bacterium which produces crystal (Cry) proteins.
ii. How are these proteins useful in agriculture?
iii. What do the different written terms **Cry** and **cry** represent respectively?

20. You find that a lake in your neighbouring area has been covered by Water hyacinth. You have contacted your friends to remove this weed. Nobody agrees to support you. How will you explain the necessity of this?

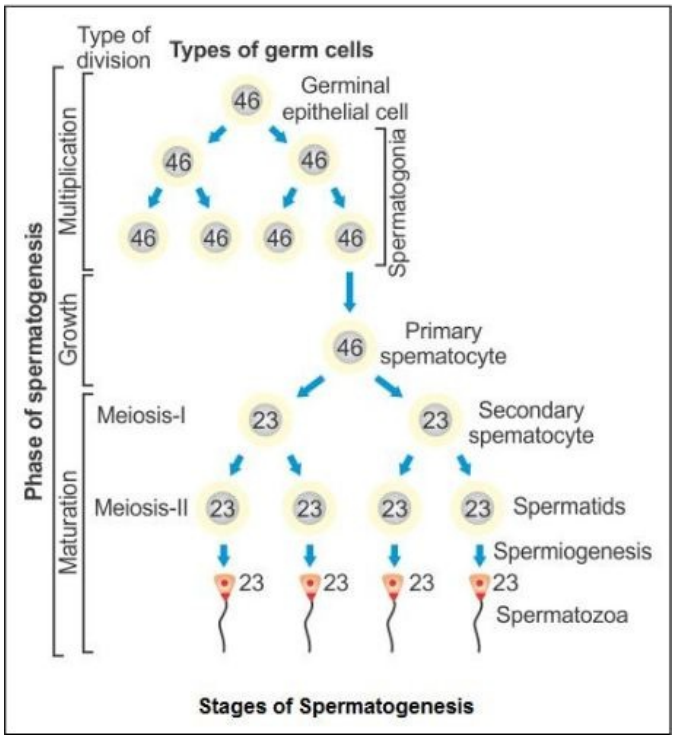
OR

Among the ecosystem services are control of floods and soil erosion. How is this achieved by the biotic components of the ecosystem?

21. Write the full form of PCR. What are the three basic steps involved in a single PCR amplification cycle?

Section D

22. Observe the diagram showing the process of spermatogenesis and answer the following questions:



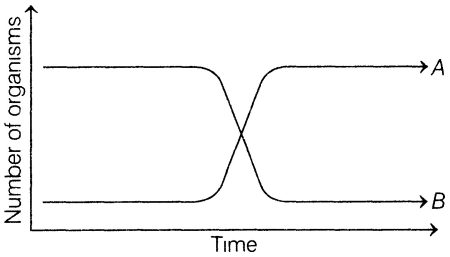
i. Spermatids possess haploid chromosome number. Explain.

ii. On the basis of the functions mentioned below, identify each one correctly.
   a. It helps in the movement of spermatozoan in a fluid medium.
   b. It contains hydrolytic enzymes and is used to contact and penetrate the egg during fertilisation.

23. Observe the following diagram for biological pest control and answer the following questions:

   i. How do organic farmers control pests? Give two examples.
   ii. State the difference in their approach from that of conventional pest control methods.

24. Two types of aquatic organisms in a lake show specific growth patterns as shown below, in a brief period of time. The lake is adjacent to an agricultural land extensively supplied with fertilisers.



Answer the questions based on the facts given above.

   i. Name the organism s depicting the patterns A and B.
   ii. State the reason for the growth pattern seen in A.
   iii. Write the effects of the growth patterns seen above.

Section E

25. In pea plants, the colour of the flower is either violet or white whereas human skin colour shows gradations. Explain giving reasons how is Possible?

OR

How are the structural genes activated in the lac operon in E. coli?

26. Give me a living cell of any plant and I will give you thousand plants of the same type. Is this only a slogan or is it scientifically possible? Write your comments and justify them.

OR

a. What are autoimmune diseases?
b. Why are autoimmune diseases called degenerative diseases?
c. Name the autoimmune disease of body muscles.
d. Which types of immunity is provided by T-lymphocytes?
e. Which immune cells form humoral immune system?

27. How does an algal bloom cause eutrophication of a water body?

OR

How does the dead organic matter get decomposed in Nature? Explain.

Answer

Section A

1. (c) Estrogens and Progesterone
   Explanation: The ovum released during ovulation undergoes several changes and change into corpus luteum that release two hormone, estrogen and progesterone.

   OR

   (a) Prevent insemination and ovulation
   Explanation: In surgical method fallopian tubes of female and vas deference of male is cut and tide to prevents insemination and ovulation.
2. (c) Acetylcholine
   Explanation: Alzheimer disease is a neurological disorder in which the death of brain cells causes memory loss and cognitive decline. It is caused in human due to deficiency of acetylcholine.

   OR

   (c) Pathogen
   Explanation: A number of bacteria, fungi, virus etc. cause disease in human beings. These disease-causing microbes are called pathogens.
3. (d) It shows independent assortment
   Explanation: It shows independent assortment
4. (b) Sticky ends
   Explanation: Sticky ends are formed in DNA segments if DNA is digested by EcoRI. Restriction enzymes cut the strand of DNA a little away from the centre of palindrome sites but between the same two bases on the opposite strands to form sticky ends.
5. (b) 1971
   Explanation: Launched in 1971, UNESCO's Man and the Biosphere Programme (MAB) is an intergovernmental scientific programme that aims to establish a scientific basis for the improvement of relationships between people and their environment and to

protects the endangered species in natural habitat.

Section B

6. Both angiosperms and vertebrates have a more complex structural organisation. They have evolved a very efficient mechanism of sexual reproduction. Since asexual reproduction does not create new genetic pools in the offspring and consequently hampers their adaptability to external conditions, so these groups have resorted to reproduction by the sexual method.

OR

Pollination is the transfer of pollen grains from the mature anther to the stigma of a flower.

Pollinating agents are-

i. Biotic
   a. insects
   b. Bats
   c. Snails
   d. Birds

ii. Abiotic
   a. Water
   b. Wind

7. The advent of the birth control pill makes it unnecessary to use other means of contraception, particularly the condom. Thus STDs are more readily transmitted during sexual activity.
8. A test cross is a cross between an organism of an unknown genotype with a homozygous recessive organism that determines the zygosity of parents. A reciprocal cross involves the same traits where the male of one type is crossed with the female of the second type and vice versa that determines the role of parental sex in the inheritance of sex linked traits. In Mendelian inheritance the result of reciprocal crosses are similar.
9. a. Start Codon- AUG. So Insertion mutation can take place and changes A to G.
   b. The translation continues till UGA because it is a stop codon.
10. i. Somatic Hybridization Development of hybrid plants through the fusion of somatic protoplasts of two different plant species/varieties is called somatic

hybridization/protoplast culture

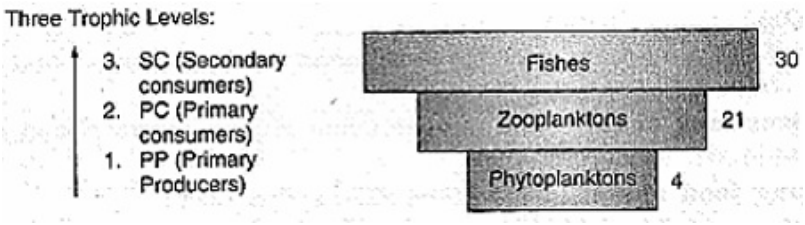
ii. Macerozymes is an enzyme from Rhizopus sp. that is used in plant protoplast preparation to digest cell wall prior to organelle isolation.

iii. PEG (Polyethene glycol)

iv. Somatic hybrid.

11. i. cry IAc codes for toxic insecticidal protein as inactive protoxins in Bacillus thuringinesis. This toxin kills the cotton bollworm.

ii. RNA interference is associated with the silencing of specific mRNA and is a method of cellular defense in eukaryotes.

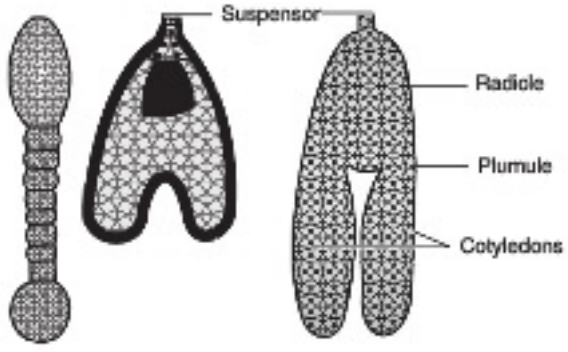
12. 

The pyramid is inverted since the biomass of fishes is much more than the phytoplankton.

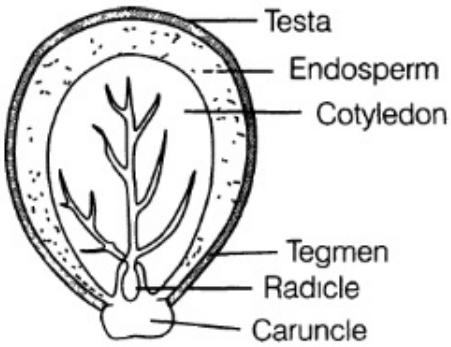
Section C

13. i. The embryo development starts only after a certain amount of endosperm is formed. It is an adaptation for assured nutrition of the developing embryo therefore, endosperm development precedes embryo development. The role of endosperm in mature albuminous seeds is the storage of reserve food for the growing embryo.

ii. The embryonic stages during the development of mature embryo sac.



14. i. LS of an albuminous seed is



ii. Advantages of seeds to flowering plants are:
   a. Provide protection to an embryo in the most delicate stage.
   b. Help in dispersal to spread in new habitats.
   c. Contain sufficient food reserves.
   d. Produce genetic variations.
   e. Seeds are related to pollination and fertilization.

15. If we take A and a as the traits
   i. Recessive
   ii. Autosomal
   iii. Parents-Aa and Aa
   Third child - aa
   Fourth child - Aa.

OR

Phenotype is the morphologically observable character which is the result of gene products brought to expression in a given environment. For example, phenotypically tall plant may be genotypically Tt or TT. Genotype is the gene complement or genetic constitution of an individual. For example genotype of hybrid tall plant is Tt, homozygous tall plant is TT and recessive dwarf plant is tt.

16. i. Adaptive radiation
   ii. It is an example of convergent evolution. Despite the temporal and geographical separation, marsupials in Australia and placental mammals in North America have produced varieties of species living in similar habitat with similar ways of living.
   iii. Darwin Finches.

17. i. X is a repressor protein when an inducer (lactose) combines with it, it is

inactivated.

ii. Z gene codes for β- galactosidase

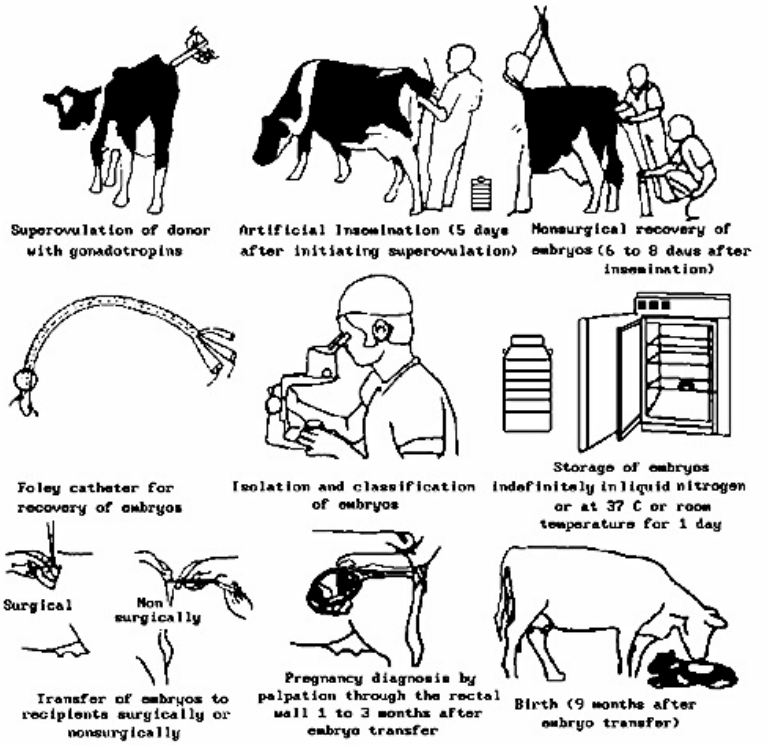
iii. The transcription of this gene would stop when repressor protein binds to the operator gene thus preventing RNA polymerase from transcribing operon in the absence of an inducer.

18. i. Raghavan was bold, having the love for animals. He had ethics and prudence.

ii. Multiple Ovulation Embryo Transfer Technology

iii.

a. The cow is administered hormones, with FSH-like activity, to induce Follicular maturation and superovulation (instead of one egg, which they normally yield per cycle, they produce 6-8 eggs).
b. The animal is either mated with an elite bull or artificially inseminated.
c. The fertilised eggs at 8–32 cells stages, are recovered non-surgically and transferred to surrogate mothers.
d. The genetic mother is available for another round of superovulation.
e. This technology has been demonstrated for cattle, sheep, rabbits, buffaloes, mares, etc. High milk-yielding breeds of females and high quality (lean meat with less lipid) meat-yielding bulls have been bred successfully to increase the herd size within a short span of time.



19. i. Soil bacterium - Bacillus thuringiensis produces crystal (Cry) proteins.

ii. This protein acts as a toxin for insects. If gene for‘Cry’, protein is incorporated into crop plants they will develop resistant to the insects and pests.

iii. 'Cry' is used for Cry protein and 'cry' is used to denote gene which encodes for ‘Cry’ protein.

20. Friends should be explained how water hyacinth can damage the ecosystem of the lake and harm the environment. Excessive growth of such aquatic weeds cause ageing of a lake by mineral enrichment of water (eutrophication) which is harmful to aquatic life.

Values

- Problem-solving
- Critical thinking
- Responsibility
- Concern for others

OR

The biotic components of an ecosystem include plants and animals. Plants play following important role in the control of flood and soil erosion:

- The roots of the plants bind the soil particles firmly and prevent soil erosion. In absence of plants, rainwater washes away the top layer of soil which finally gets deposited in the river beds leading to decrease in depth of river. This causes flood.
- Roots of the plants and the humus make the soil porous. This helps in percolation of the water into the soil and reduces the speed of the water flow.

21. The polymerase chain reaction (PCR) was originally developed in 1983 by the American biochemist Kary Mullis. He was awarded the Nobel Prize in Chemistry in 1993 for his pioneering work. PCR involves a process of heating and cooling called thermal cycling which is carried out by machine. **There are three main stages:**

- **Denaturation** – when the double-stranded template DNA is heated to separate it into two single strands.
- **Annealing** – when the temperature is lowered to enable the DNA primers to attach to the template DNA.
- **Extension** – when the temperature is raised and the new strand of DNA is

made by the Taq polymerase enzyme.

Section D

22. i. Spermatids are produced by meiosis during spermatogenesis. Thus, they possess haploid number of chromosomes.
    ii. a. Sperm tail
    b. Acrosome
23. i. The organic farmers control pests by the use of insect pests resistant varieties. The two examples are
    a. The Pusa Gaurav variety of Brassica is resistant to aphids.
    b. Pusa Sawani vartiety of Okra is resistant to shoot and fruit borer.
    ii. The use of resistant variety is safer to control the pests as it does not involve chemical pesticides which are used in conventional method of controlling pests. Thus, it is environmental friendly method and reduce soil pollution.
24. i. The organisms depicting pattern A are microorganisms, while B depicts zooplanktons or fishes.
    ii. With the increase in organic matter of lake due to influx of nutrients from agricultural land, the number of microorganisms increases which degrade the organic matter.
    iii. From the above growth patterns, it can be concluded that
    a. With the increase in microbes in water body, the BOD increases, making it unfit for aquatic life.
    b. Dissolved oxygen reduces drastically leading to mortality of aquatic organisms, i.e. fishes.

Section E

25. In pea plants; the colour of flower whether violet or white is determined by a single gene pair. A single gene controls the expression of the full trait. The presence of tw0 such genes for the trait does not influence the expression of the trait. A pea plant will have violet colour flower whether it is homozygous (VV) or heterozygous (Vv). There is no variation in the intensity of violet colour-Its inheritance is also called as **monogenic inheritance.**

    In human, skin colour shows six gradations ranging between as black as in negro (AABBCC) to white or very light (aabbcc) as in the Caucasians. The skin colour is caused by melanin pigment. The quantity of melanin is due to three air of polygenes

(A, B and C).

The skin colour in humans shows a **polygenic/quantitative inheritance**. It is a type of inheritance controlled by one or more genes in which the dominant alleles have a cumulative/additive effect, with each dominant allele expressing a part or unit of trait and the full trait being shown when all the dominant alleles are present. It is also called a **multiple factor inheritance.**

OR

In the lac-operon in E.coli, three structural genes z, y and a are present. These genes code for different polypeptides, z-gene codes for beta-galactosidase to break lactose into galactose and glucose, y-zene codes for permease which facilitates entry of lactose and the a-gene codes or transacetylase. Presence or absence of lactose in the cell regulates switch on or off operon and is termed **inducer**. The lactose in the cell combines with the repressor protein synthesised by i-gene to form inactive repressor which does not bind to operator gene and the RNA polymerase from promoter gene moves to the structural genes to help in transcription. In the absence of lactose, the repressor binds to the operator gene and RNA polymerase cannot move from promoter gene, and thus there is no transcription.

26. It is scientifically possible to grow a thousand plants from a single living cell of any plant and this process is called micropropagation.

    The property of plant cells that helped them to grow into a new plant is totipotency.

    Micropropagation is the use of plant cell culture to regenerate a large number of plants.

    This results in genetically identical plants and is also called clonal propagation.

    Hence, the desirable characters are kept constant for many generations.

    Micropropagation is widely used in horticulture and in floriculture. Plants can be obtained throughout the year under controlled conditions.

OR

a. Disorders in which the immune system of an individual starts rejecting its own body cells are called autoimmune diseases.
b. In autoimmune diseases, certain body cells undergo degeneration that's why these are called as degenerative diseases.

c. Myasthemia gravis is an autoimmune disease of body muscles.
d. Cell-mediated immunity is provided by T-lymphocytes.
e. B-lymphocytes cells form the humoral immune system.

27. The excessive growth of algae, plants, and animals in water bodies due to nutrient enrichment is called **eutrophication.** The excess growth of planktonic algae that causes colouration of water is called **algal bloom.** Eutrophication is both **natural** and **accelerated** Natural eutrophication is a very slow process while **accelerated** or **cultural eutrophication** occurs due to disposal of sewage and runoff from fertilized fields into ponds, lakes and other water bodies. Nutrients present in sewage and fertilizers such as phosphate and nitrates; promote rich growth of planktonic algae, which support a good number of animals. Algal blooms and floating plants cut off light from submerged plants resulting in their death. There is a drastic decrease in oxygen replenishment inside water. It causes the organic loading of water. Decreased oxygen level also kills aquatic animals, further adding to organic loading. Decomposition is replaced by putrefaction which is anaerobic. It produces putrefaction which is anaerobic. It produces plants as well.

OR

Decomposition is a process by which decomposers breakdown complex organic matter into inorganic substances like CO_2, H_2O and nutrients.

i. Detritus is the raw material for decomposition, composed of dead plant remains such as leaves, bark, flowers and dead remains of animals including faecal matter. Warm and moist environment favours decomposition whereas low temperature and anaerobiosis inhibit decomposition resulting in piling up of organic matter.
ii. The important steps in the process of decomposition are:
    a. fragmentation: It is the process of breaking down of detritus into smaller particles by detrivores (e.g., earthworm).
    b. Leaching: Water-soluble inorganic nutrients go down into the soil horizon and get precipitated as unavailable salts.
    c. Catabolism: Bacteria and fungi secrete enzymes which degrade detritus into the simpler inorganic substances.
    d. Humification: It leads to the accumulation of a dark-coloured amorphous substance called humus. Humus is highly resistant to microbial action and

undergoes decomposition at an extremely slow rate.

e. Mineralization: Humus is further degraded by some microbes and release of inorganic nutrients occur in this process.

iii. Decomposition is a largely anaerobic process. Rate of decomposition is affected by:

a. Chemical composition of detritus.
   In a particular climatic condition- The rate decomposition is slower, if the detritus is rich in lignin and chitin and quicker, if the detritus is richer in nitrogen and water-soluble substances e.g., sugars.

b. Climatic factors- Temperature and soil moisture regulate decomposition through their effects on the activities of soil microbes.