CBSE Class 12 Biology
Sample Paper 08 (2019-20)

Maximum Marks:
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. Primary germ layers are

    a. Trophoblast, ectoderm and mesoderm

    b. Blastocyct, ectoderm, and endoderm

    c. Trophoectoderm, trophomesoderm and trophoenderm

    d. Ectoderm, mesoderm and endoderm

OR

Statement I: In zygote intra fallopian transfer(ZIFT) embryo upto 8 blastomeres are

transferred into fallopian tube.
Statement II: In intra uterine transfer, embryo more than 8 blastomeres are transferred to uterus.

a. Statement II is correct only

b. Both the statements are incorrect

c. Both statements are correct

d. Statement I is correct only

2. Transformation of normal cells into cancerous neoplastic cells may be induced by chemical, physical or biological agents called

a. Carcinogens

b. Megacinogen

c. cancer agents

d. Retrovirus agents

OR

Which one of the following is a bridge linking childhood and adulthood?

a. Young age

b. Adulthood

c. Adolescence

d. Puberty

3. Which one of the following nucleotide sequence in DNA is recognised by ECoRI

a. $\begin{matrix} 5'G \overset{\downarrow}{-} A-A-T-T-C-3' \\ 3'C-T-T-A-A \underset{\uparrow}{-} G-5' \end{matrix}$

b. $5'G-A-A-T\overset{\downarrow}{-}T-C-3'$
$3'C-T\underset{\uparrow}{-}T-A-A-G-5'$

c. $5'G-A\overset{\downarrow}{-}A-T-T-C-3'$
$3'C-T-T-A\underset{\uparrow}{-}A-G-5'$

d. $5'G-A-A\overset{\downarrow}{-}T-T-C-3'$
$3'C-T-T\underset{\uparrow}{-}A-A-G-5'$

4. The ability to multiply copies of antibiotic resistance gene in E.coli was called

   a. Transformation

   b. Restriction

   c. Mutation

   d. Cloning

5. To qualify as a biodiversity hotspot , as per Myers hotspot map:
   a) it must contain at least 0.5% or 1,500 species of vascular plants as endemics.
   b) it has to have lost at least 70% of its primary vegetation.

   a. both statements are correct.

   b. Statement a) is correct but b) is wrong.

   c. both statements are wrong.

   d. Statement b) is correct but a) is wrong.

Section B

6. How is parthenocarpy different from parthenogenesis? Give an example of each.

OR

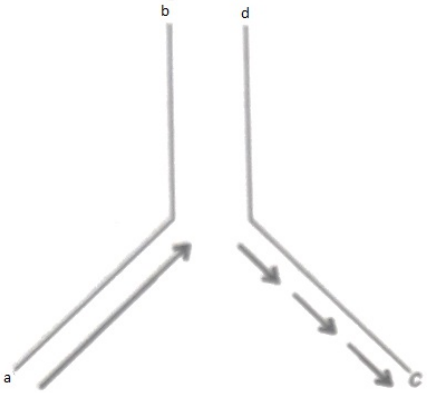
The characteristic features and function of tapetum.

7. In the table given below, select and enter one correct device out of the following: Oral pill, Condom, Copper T, Saheli, Vasectomy, Diaphragm, Tubectomy, Cervical cap

Method of Birth Control	**Device**
1. Barrier	
2. IUD	
3. Surgical Technique	
4. Administering Hormones	

8. What is meant by chromosomal mutation?

9. Mention the polarity of the DNA strands a - b and c - d shown in the replicating fork given below:



10. How is somatic hybridization carried out? Mention one example of a somatic hybrid.

11. Define **Germ line gene therapy.**

12. Due to uncontrolled excessive hunting the population of tigers in a forest becomes zero. Discuss the long term effects of this situation on the population of deer in that forest.

Section C

13. What is agamospermy? How is agamospermy different from parthenogenesis and parthenocarpy?

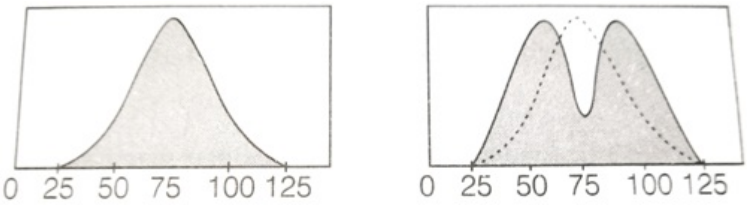
14. Describe the development of a fruit.

15. The male fruit fly and female fowl are heterogametic while the female fruit fly and the male fowl are homogametic. Why are they called so?

OR

List any four symptoms of Down's syndrome. What is the basis of this disorder?

16. Refer the graph and answer the questions that follow:



i. The graph depicts which type of natural selection?
ii. Explain the other two effects/types of natural selection.

17. Study the mRNA segment given below, which is complete and to be translated into a polypeptide chain and answer the following questions:

i. Write codons 'A' and 'B'.
ii. What do they code for?
iii. How is the peptide bond formed between two amino acids in the ribosome?

18. Write a short note on single cell protein(SCP).

19. List the three molecular diagnostic techniques that help to detect pathogens from suspected patients. Mention one advantage of these techniques over conventional methods.

20. Briefly classify the extinction processes.

OR

What is a biosphere reserve? Name different zones of the biosphere reserve.

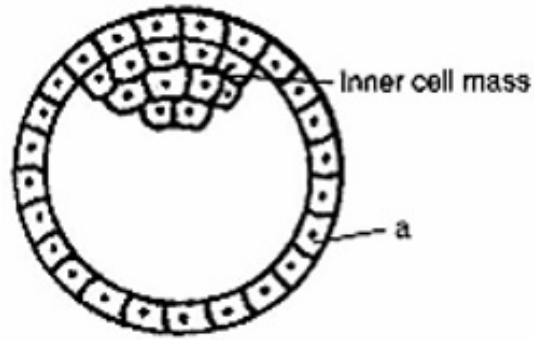
21. During an excursion to a botanical garden, the teacher shows an old tree which was on the verge of extinction. As soon as the teacher advanced with the students, some

enthusiastic students climbed up the tree and started cutting the branches, collecting its leaves as the precious collection. Rajesh instead took photographs of the tree from various angles. The boys mocked at Rajesh while the teacher appreciated him.

i. What values did Rajesh possess?
ii. Why should we conserve biodiversity?
iii. How can be biodiversity be conserved?

Section D

22. Study the below figure and answer the question that follows:

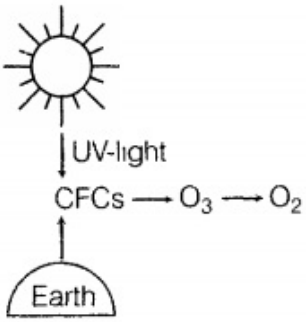


i. Identify 'a' and which part of the placenta is formed by 'a'?
ii. Mention the fate of the inner cell mass after implantation in the uterus.
iii. Where are the stem cells located in this embryo?

23. Observe the figure with respect to the leguminous plant and answer the following questions:

i. Why is Rhizobium categorised as a symbiotic bacterium? How does it act as a biofertiliser?
ii. How do plants benefit from having the mycorrhizal symbiotic association?

24. Observe the diagram and answer the following questions:



i. Expand CFC.
ii. How does it reduce ozone to oxygen?
iii. How does CFC affect the ozone layer?

Section E

25. You are given a red flower bearing pea plant and a red flower bearing snapdragon plant. How would you define the genotypes of these two plants with respect to the color of the flower? Explain with the help of crosses. Comment upon the pattern of inheritance seen in these two plants.

OR

Differentiate between the followings:
(a) Repetitive DNA and Satellite DNA
(b) mRNA and tRNA
(c) Template strand and Coding strand

26. Explain the following terms:

i. Callus and suspension cultures
ii. Meristem culture
iii. Embryo culture

OR

i. Cancer is one of the most dreaded diseases. Explain contact inhibition and metastasis with respect to disease.
ii. Name the group of genes that have been identified in normal cells that could lead to cancer. How do these genes cause cancer?
iii. Name any two techniques that are useful in detecting cancers of internal organs.

iv. Why are cancer patients often given a-interferon as part of the treatment?

27. Explain, biomagnification of DDT in an aquatic food chain. How does it affect the bird population?

OR

i. Explain primary productivity and the factors that influence it.
ii. Describe, how do oxygen and chemical composition of detritus control decomposition?

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Solution

Section A

1. (d) Ectoderm, mesoderm and endoderm
   Explanation: Development of fetus start from zygote divisions to form embryo. The embryo undergoes multiple divisions to form blastocysts that arrange into layers. The primary layers are ectoderm, mesoderm and endoderm.

   OR

   (c) Both statements are correct
   Explanation: In test tube baby programme, sperms and ovum are fertilized in laboratory condition to form zygote. If embryo is transferred up to 8 blastomeres, it is called ZIFT. If embryo having more than 8 blastomeres, it is transferred to uterus called IUT.
2. (a) Carcinogens
   Explanation: A carcinogen is any substance, radionuclide, or radiation that is an agent directly involved in causing cancer. This may be due to the ability to damage the genome or to the disruption of cellular metabolic processes. UV radiation, X-rays, oncogenes are example of carcinogens.

   OR

   (c) Adolescence
   Explanation: Adolescence is a bridge linking childhood and adulthood. It is accompanied by several biological and behavioral changes. Thus, it is a very vulnerable phase of mental and psychological development.
3. (a)

$$5'G \overset{\downarrow}{-} A - A - T - T - C - 3'$$
$$3'C - T - T - A - A \underset{\uparrow}{-} G - 5'$$

Explanation:

$$5'G \overset{\downarrow}{-} A - A - T - T - C - 3'$$
$$3'C - T - T - A - A \underset{\uparrow}{-} G - 5'$$

4. (d) Cloning
   Explanation:

   There are three basic steps in genetically modifying an organism:

   - Identification of DNA with desirable genes;
   - Introduction of the identified DNA into the host;
   - Maintenance of introduced DNA in the host and transfer of the DNA to its progeny

   When recombinant DNA is transferred into Escherichia coli, a bacterium closely related to Salmonella, it could replicate using the new host's DNA polymerase enzyme and make multiple copies. The ability to multiply copies of antibiotic resistance gene in E. coli was called cloning of antibiotic resistance gene in E. coli. .

5. (a) both statements are correct.
   Explanation: A biodiversity hotspot is a biogeographic region that is both a significant reservoir of biodiversity and is threatened with destruction. To qualify as a biodiversity hotspot, a region must meet two strict criteria: Contain at least 1,500 species of vascular plants (> 0.5 percent of the world's total) as endemics (species found nowhere else on Earth). Have lost at least 70 percent of its original habitat.

Section B

6. - **Parthenocarpy** is the development of fruit from the ovary without fertilization. Such fruits do not contain any seeds. This phenomenon takes place only in plants. For example- Banana.
   - **Parthenogenesis** is the development of an embryo without fertilization in animals while in plants, it is a part of apomixis. For example- Honeybee, Rotifers, *Ulothrix* (green algae).

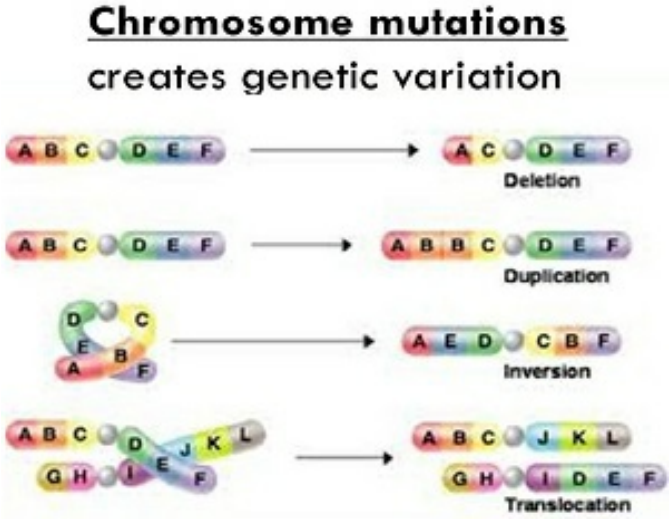
OR

The tapetal cells possess dense cytoplasm and become multinucleate or undergo endoploidy. These cells provide nutrition to the developing pollen grains. Tapetum secretes both enzymes and hormones and special proteins for the pollen grains to recognize compatibility.

7.

Method of Birth Control	**Device**
1. Barrier -	Condom, Diaphragm, Cervical cap
2. IUD -	Copper T
3. Surgical Technique -	Vasectomy, Tubectomy
4. Hormonal administrations -	Oral pill, Saheli.

8. A mutation involving a long segment of DNA. These mutations can involve deletions, insertions, or inversions of sections of DNA. In some cases, deleted sections may attach to other chromosomes, disrupting both the chromosomes that loses the DNA and the one that gains it. Also referred to as a chromosomal rearrangement.



9. a - b : $3^{'} \rightarrow 5^{'}$ polarity, c - d : $5^{'} \rightarrow 3^{'}$polarity

10. To perform somatic hybridization, protoplasts are isolated from two different varieties of plants with desired traits by digesting cell wall followed by their fusion which leads to the formation of hybrid protoplast which can be further grown to form to new hybrid plant. E.g. - Pomato (fusion of potato and tomato).

11. It is a therapy in which germ cells i.e., sperms or eggs (even zygotes) are modified by the introduction of functional genes which are ordinarily integrated into their genomes. Therefore, the change due to therapy is heritable and passed on to later generations.

12. The reduction in predator population may result in the increase of prey population (deer), since they are not prayed upon. Increase in the number of deer will lead to overgrazing hence, shortage of herbs and eventually reduction in the number of deer.

Section C

13. Agamospermy is a type of apomixes which involves the production of seed and embryo without meiosis and fertilizations. Parthenogenesis is another form of apomixes in which seeds develop from unfertilized female gamete and their chromosomal number (haploid or diploid) depend on the nature of megaspore.

    Parthenocarpy is the development of fruit without fertilization and the fruits are seedless.

14. **Development of fruit:** The fruit-a ripened ovary, has a fruit wall-the pericarp which develops from the wall of the ovary.
    The development of fruit occurs differently in various fruits which can be explained as follows:
    1. Fruit may develop from only the ovary part of a flower-true fruit (eucarp)
    2. Fruit may develop from the ovary along with adjoining accessory floral parts (sepals, petals, thalamus, inflorescence axis)-false fruit (pseudocarp) e.g., apple
    3. In parthenogenesis, the fruit develops without fertilisation e.g., banana.

15. Cell type of male fruit fly - XY
    Female fowl - ZW
    The sex chromosomes are different, hence, they are called heterogametic.
    While female fruit fly has XX and male fowl has ZZ. The sex of chromosomes are similar hence homogametic.

OR

Four symptoms of Down's syndrome are:

(a) feeble minded
(b) retarded growth
(c) rounded face and broad forehead
(d) permanently open mouth.

It is an autosomal aneuploidy or 21 trisomy. In this case the egg possesses 24 chromosome instead of 23 and the offspring has 47 chromosomes. (45 + XY in male, 445 + XX in female) instead of 46.

16. i. The graph depicts disruptive natural selection. This type of selection tends to eliminate intermediate types.
    ii. The other two types of natural selection are
        a. Directional selection - Large number of individuals acquire value other than mean character value.
        b. Stabilizing selection - Large number of individuals acquire mean character value.
17. i. A-AUG, B-UAA/UAG/UGA
    ii. AUG codes for methionine. UAA/UAG/UGA does not code for any amino acid, but brings about termination of polypeptide synthesis.
    iii. In the large subunit of ribosome, there are two sites in which subsequent amino acids bind to and come close enough for the formation of peptide bond. It is catalysed by the enzyme called peptidyl transferase.

18. Microbes especially cyanobacteria are grown on an industrial scale as a source of good protein. Microbes can be easily grown on materials like wastewater from potato processing plants, straw, molasses, animal manure, and even sewage, to produce large quantities of biomass and can serve as food rich in proteins, minerals, fats, carbohydrates, and vitamins.
    These microbes have a high rate of biomass production and growth. 250 g of *Methylophilus methylotrophus* can produce 25 tones of proteins. The flourishing of mushroom culture on a large scale is the indication that the people have accepted microbes as the food and are consuming it.

19. Molecular diagnostic techniques to detect pathogens from suspected patients are as follows

i. Polymerase Chain Reaction (PCR)
ii. Recombinant DNA technology
iii. Enzyme Linked Immuno Sorbent Assay (ELISA)

The advantage of these techniques is that they help in the early detection and treatment of diseases, which is not possible by the conventional diagnosis.

20. Extinction of species: The extinction of species is a natural process. Many species have disappeared and new ones have evolved to take over their place. There are three types of extinction processes:

i. Natural extinction: When there is a change in environmental conditions, certain species disappear and others, (which are more adapted to changed conditions) take their place. This loss of species that occurred in the geological past at a very slow rate is known as natural (background extinction).
ii. Mass extinction: There have been several periods in the earth's geological history when a large number of species became extinct due to catastrophes.
iii. Anthropogenic extinction: Recently more number of species is disappearing from the face of the earth due to human activities. Man-made mass extinction represents a very severe depletion of biodiversity.

OR

The biosphere reserve is a special category of a protected area of land and/or coastal environment, wherein people are an integral component of the system. Biosphere reserves are representative examples of natural biomes and contain unique biological communities. They have three zones:

i. Transition zone
ii. Buffer zone
iii. Core area.

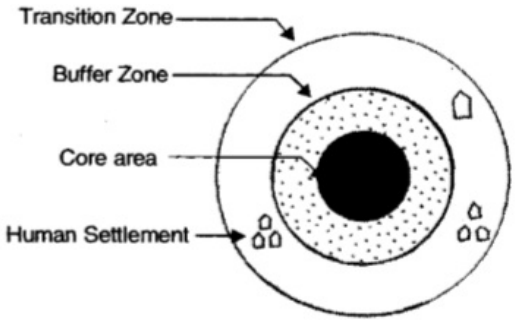


Figure: Different zones of Biosphere Reserve

21. i. Respect for nature, scientific attitude with a vision of the future

ii. We should conserve Biodiversity since it provides us

a. The main source of food
b. Source of economically important fibres (cotton, flax, hemp, jute etc)
c. Plant products (gum, resin, dye, fragrance, waxes, wool, leather, honey, lac, pearl, ivory, silk, horns)
d. Drugs and medicine
e. Sports and recreation
f. Aesthetic value
g. Cultural value
h. Scientific research
i. Ecosystem services
j. (More points may be added)

iii.

Ginkgo biloba

In situ conservation: Sacred Grove, Biosphere reserve (Terrestrial and Marine), National park and Wildlife and sanctuaries etc.

Ex situ conservation: a) Sacred plants, home gardens b) Seed banks, gene bank,

cryopreservation c) Botanical garden, zoological garden, Aquaria etc.

Special note:
UNDP has developed a new Biodiversity and Ecosystems Global Framework for the period 2012-2020, positioning the organization to respond to future challenges – which include implementing the global Aichi Biodiversity Targets set out in the CBD Strategic Plan and advancing the sustainable development agenda the emerged from the Rio+20 Summit.

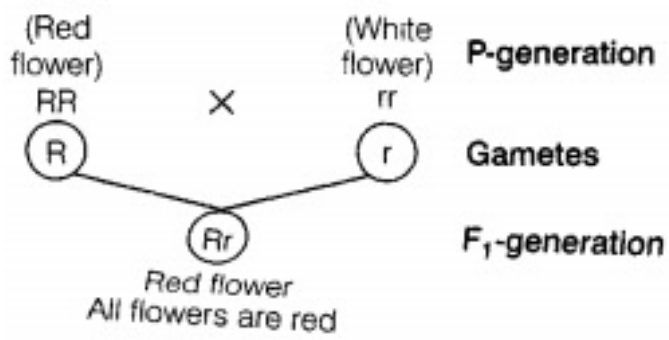
Section D

22. i. 'a' is Trophoblast. It forms chorionic villi and foetal part of the placenta.
    ii. It gets differentiated into ectoderm and endoderm.
    iii. In the inner cell mass.
23. i. Rhizobium lives in the root nodules of leguminous plants and fixes the atmospheric nitrogen in the soil as nitrogenous compounds that can be utilised by the plants as nutrients. Since, both are mutually benefitted, it is called symbiotic bacterium.
    ii.
    - The fungus absorbs phosphorus from the soil and passes it to the plant.
    - Plants with mycorrhiza show resistance to root-borne pathogens.
    - They show increased tolerance to salinity and drought.
    - These show an overall increase in plant growth and development.
24. i. CFC- Chlorofluorocarbon.
    ii. The concept of JFM was introduced by the Government of India. In this program, support of local communities was taken for conservation of forests and in return, the local people were made to use the products obtained from the forest free of cost. In this program, local people protect the forest, which helps in the conservation of the forest and its biodiversity.
    iii. Once in the atmosphere, CFCs drift slowly upward to the stratosphere, where they are broken up by ultraviolet radiation, releasing chlorine atoms, which are able to destroy ozone molecules.

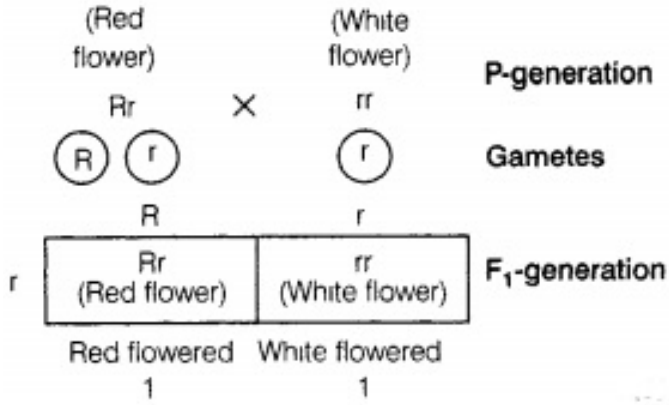
Section E

25. Genotypes of these two plants with respect to the color of the flower can be tested by applying the test cross.
    Pea Plant

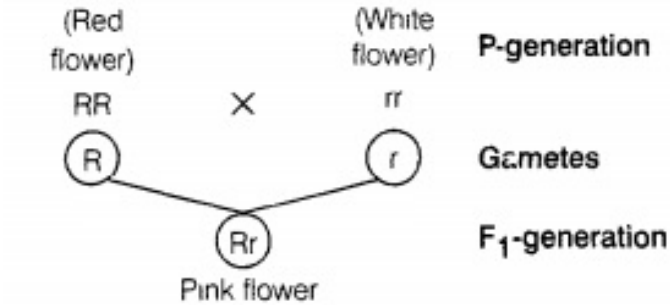
i. **Homozygous red flower:** If the plant is homozygous dominant, all the plants in the progeny would have red flowers.



ii. **Heterozygous red flowers:** If the plant is heterozygous, the offsprings would be red-flowered and white-flowered plants in the ratio of 1 : 1.



Snapdragon



In the given cross, when a red-flowered plant is crossed with a white-flowered plant, the progeny would consist of pink-flowered plants. In this case, red-flowered plants are homozygous dominant and pink-flowered plants are heterozygous. The reason for this is incomplete dominance, i.e neither of the two alleles is completely dominant over the other and the hybrid is intermediate between the two, i.e pink-flowered.

OR

(a) Satellite DNA consists of highly repetitive DNA, and is so called because repetitions of a short DNA sequence tend to produce a different frequency of the nucleotides adenine, cytosine, guanine and thymine, and thus have a different density from bulk DNAsuch that they form a second or 'satellite' band when genomic DNA is separated on a density gradient.
(b) Messenger RNA transfers the code or instructions to produce certain type of proteins. Transcription RNA decodes these codes at the site of protein synthesis.
(c) The coding strand is the DNA strand which has the same base sequence as the RNA transcript produced (although with thymine replaced by uracil). It is this strand which contains codons, while the non-coding strand contains anti-codons. The strand containing codon is called template strand and provides a template based on which new RNA is made.

26. i. **Callus and suspension cultures:** A callus culture is an unorganized and undifferentiated mass of cells on an agar-gelled medium while a suspension culture is cells/tissues cultured in a liquid medium which then produce clumps of few to many cells. The cells become meristematic and divide to give rise to a mass of cells. Suspension cultures grow faster than the callus cultures but callus cultures are easier to maintain as they don't need agitation unlike suspension culture.
    ii. **Meristem culture:** The cultivation of axillary or apical shoot meristems is called meristem culture. The meristems are generally free from virus. The explants commonly used in meristem culture are shoot apices and nodal segments. These explants are cultured on a medium containing cytokinins. The plantlets thus obtained are subjected to hardening and ultimately established in the field.
    iii. **Embryo culture:** It involves removing of young embryos from developing seeds and placing them on suitable nutrient medium to get the seedlings.

OR

i. Contact inhibition is the property exhibited by normal cells. It prevents their uncontrolled proliferation when they are in contact with other neighbouring cells. But cancerous cells seem to have lost this property and continue to divide despite being in contact with other cells, which leads to masses of cells called tumours. Metastasis is the property exhibited by malignant tumours which grow rapidly,

invades neighbouring tissues and is capable of reaching distant sites through blood and lymph thus, spreading malignant tumours to other organs or parts of the body.

These two properties make 'cancer' one of the dreaded diseases.

ii. The group of genes called cellular oncogenes or proto-oncogenes in normal cells could lead to cancer.

These genes are present in inactivated or suppressed form. Some factors, i.e physical, chemical or biological called carcinogens are capable of activating these oncogenes and thus, transforming normal cells into a cancerous one.

iii. The two techniques useful m detecting cancers of internal organs are CT (Computed Tomography) and MRI (Magnetic Resonance Imaging).

iv. As tumour cells are capable of avoiding recognition and destruction by the immune system, the cancer patients are given α-interferons which are biological response modifiers. It helps in activating the immune system and destroy tumours.

27. Biomagnification is a continuous increase in the concentration of chemicals in successive trophic levels in a food chain. For example, regular DDT sprays for a few years results in a drastic decline in the population of fish-eating birds.
There was 1000 times increase in the concentration of DDT in phytoplankton as compared to water, in zooplankton as compared to phytoplankton, in different fish as compared to zooplankton and more FFT in fish-eating birds as compared to fish.
Higher amounts of pesticide disturb calcium metabolism of birds resulting in thinning of eggshells and their premature breaking that kills the embryos. Thus, causing a decline in the population.

OR

i. Primary Productivity (PP) is the amount of biomass or organic matter produced per unit area over a time period by plants during photosynthesis. It can be divided into

Gross Primary Productivity (GPP): It is the rate of production of organic matter during photosynthesis. A considerable amount of GPP is utilized by plants in respiration

Net Primary Productivity (NPP): It is the amount of energy left in the producers

after the utilization of some energy for inspiration.

Factors affecting primary productivity are:

- Availability of nutrients.
- Quality and duration of sunlight.
- Water availability.
- The temperature of a given place.
- Type of plant species.
- Photosynthetic capacity of plants.

ii. **Effect of oxygen:** The decomposition of detritus is an energy-requiring process. Most of the decomposers (bacteria and fungi) are aerobic organisms. They require oxygen for their cellular activities while acting on dead organic matter.

Effect of chemical composition: Decomposition rate is slower if detritus is rich in lignin and chitin. It is quicker if detritus is rich in nitrogen and water-soluble substances like sugars.