CBSE Sample Paper -05
Class 12 Biology
(Questions)

General Instructions:

(i) All questions are compulsory.

(ii) This question paper consists of four Sections A, B, C and D. Section A contains 5 questions of one mark each, Section B is of 5 questions of two marks each, Section C is of 12 questions of three marks each and 1 question of four mark and Section D is of 3 questions of five marks each.

(iii) There is no overall choice. However, an internal choice has been provided in one question of 2 marks, one question of 3 marks and all the three questions of 5 marks weightage. A student has to attempt only one of the alternatives in such questions.

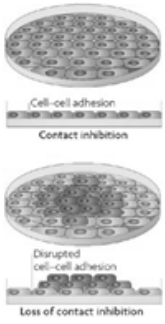
(iv) Wherever necessary, the diagrams drawn should be neat and properly labelled.

Section A

1. What are cleistogamous flowers?
2. What is coleorrhiza?
3. What are alleles?
4. What are introns?
5. What is apiculture?

Section B

6. Explain MOET.
7. Write a note on discovery of penicillin.
8. What does the diagram below signify?



What are the basic steps involved in genetically modifying an organism?

OR

What is humus?

10. Represent the age pyramids for human population.

Section C

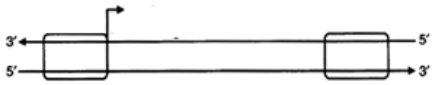
11. Explain the parts of an ovule with a diagram.
12. How is RNA synthesized in bacteria? Illustrate.
13. Discuss the barrier methods for contraception.
14. Explain convergent evolution with examples.
15. What are the major causes of cancer?
16. Is it possible to obtain large quantities of DNA from a single cell?
17. What are the advantages of GM plants?
18. Explain T_i plasmid of Agrobacterium tumefaciens.
19. Give the equations of both exponential and logistic growth curves. Also represent them graphically.

Or

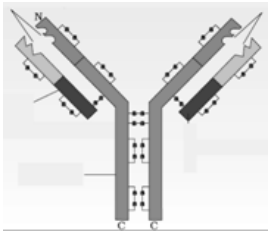
Present a case study for remedy of plastic waste.

Give an account of surgical sterilization methods in males and females.

20. Complete the diagram below.



21. Haploid content of human DNA is 3.3×10^9bp and the distance between 2 consecutive bp is 0.34×10^{-9}. What is the length of the DNA molecule?
22. Label the diagram



23. **Rita and her parents were watching a TV serial in the evening. During a commercial break,an advertisement flashed on the screen which was promoting use of sanitary napkins. Ritawas still watching the TV. The parents got embarrassed and changed the channel. Ritaobjected to her parents' behavior and explained the need for these advertisements.**
    a) What values did the parents show?
    b) Briefly describe the phases of a menstrual cycle.

Section D

24. What are the post pollination events?

Or

Explain endosperm development.

25. What are chromosomal disorders?

Or

List the observations of Human Genome Project.

26. Explain some inter specific relationships where no species is harmed.

Or

Explain ecological succession.

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Class 12 Biology

Answers

Section A

1. Self pollinating flowers in which stamens and pistil are in close proximity.
2. In embryos of monocots the root cap and radicle are enclosed in an undifferentiated sheath called coleorhizae.
3. Genes which code for a pair of contrasting traits.
4. Intervening sequences in DNA which are not expressed.
5. Rearing of bees.

Section B

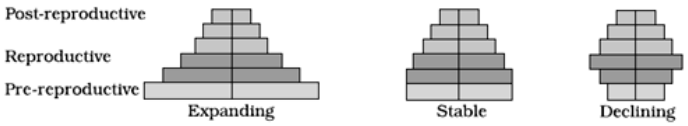
6. Multiple Ovulation Embryo Transfer Technology (MOET) is a programme for herd improvement. In this method, a cow is administered hormones, with FSH-like activity, to induce follicular maturation and super ovulation – instead of one egg, which they normally yield per cycle, they produce 6-8 eggs. The animal is either mated with an elite bull or artificially inseminated. The fertilised eggs at 8–32 cells stages, are recovered non-surgically and transferred to surrogate mothers. The genetic mother is available for another round of super ovulation.
7. Alexander Fleming while working on *Staphylococci* bacteria, once observed a mould growing in one of his unwashed culture plates around which *Staphylococci* could not grow. He found out that it was due to a chemical produced by the mould and he named it Penicillin after the mould*Penicilliumnotatum.*
8. The first diagram is that of normal cells which show controlled growth due to property of contact inhibition.

   The second diagram shows loss of contact inhibition by cancer cells.This uncontrolled cell growth leads to tumor.
9. Three basic steps in genetically modifying an organism are
   (i) identification of DNA with desirable genes;
   (ii) introduction of the identified DNA into the host;
   (iii) maintenance of introduced DNA in the host and transfer of the DNA to its progeny.

OR

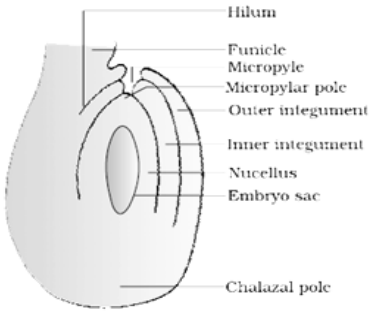
Humus is a dark coloured amorphous substance called **humus** that is highly resistant to microbial action and undergoes decompositionat an extremely slow rate. Being colloidal in nature it serves as a reservoirof nutrients. The process of humus formation is called humification.

10. Age pyramids for human population



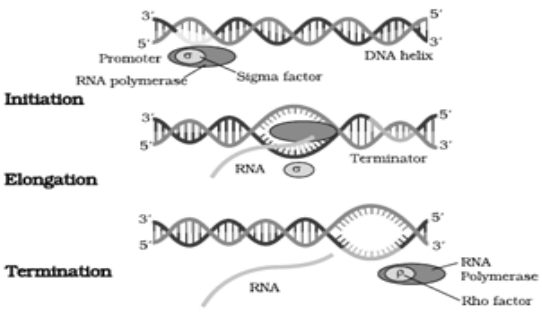
Section C

11.



The ovule is a small structure attached to the placenta by means of a stalk called **funicle**.The body of the ovule fuses with funicle in the region called **hilum.**Each ovule has one or two protective envelopes called **integuments.**Integuments encircle the ovule except at the tip where a small opening called the **micropyle**is organised. Opposite the micropylar end, is the **chalaza**, representing the basal part of the ovule.Enclosed within the integuments is a mass of cells called the **nucellus**.Cells of the nucellus have abundant reserve food materials. Located in the nucellus is the **embryo sac** or **female gametophyte**.

12.



In bacteria, there are three major types of RNAs: mRNA (messenger RNA), tRNA (transfer RNA), and rRNA (ribosomal RNA). The mRNA provides the template, tRNA brings aminoacids and reads the genetic code, and rRNAs play structural and catalytic role during translation. There is single DNA-dependent RNA polymerase that catalysestranscription of all types of RNA in bacteria. RNA polymerase binds to promoter and initiates transcription (Initiation).

It uses nucleoside triphosphates as substrate and polymerises in a template depended fashion following the rule of complementarity.It also facilitates opening of the helix and continues elongation. Only a short stretch of RNA remains bound to the enzyme. Once the polymerases reaches the terminator region, the nascent RNA falls off, so also the RNA polymerase. This results in termination of transcription.

13. In **barrier** methods, ovum and sperms are prevented from physically meeting with the help of barriers. Such methods are available for both males and females.

Condoms are barriers made of thin rubber/ latex sheath that are used to cover the penis in the male or vagina and cervix in the female, just before coitus so that the ejaculated semen would not enter into the female reproductive tract. This can prevent conception.

Diaphragms, cervical caps and **vaults** are also barriers made of rubber that are inserted into the female reproductive tract to cover the cervix during coitus. They prevent conception by blocking the entry of sperms through them cervix. They are reusable.

Spermicidal creams, jellies and foams are usually used along with these barriers to increase their contraceptive efficiency.

Intra Uterine Devices (IUDs). These devices are inserted by doctors or expert nurses in the uterus through vagina. These Intra Uterine Devices are presently available as the non-medicated IUDs (e.g., Lippes loop), copper releasing IUDs (CuT, Cu7, Multiload 375) and the hormone releasing IUDs (Progestasert, LNG-20). IUDs increase phagocytosis of sperms within the uterus and the Cu ions released suppress sperm motility and the fertilising capacity of sperms. The hormone releasing IUDs, in addition, make the uterus unsuitable for implantation and the cervix hostile to the sperms.

14. **Convergent evolution** - evolution of different structures for the same function and hence having similarity. The similar habitat that has resulted in selection of similar adaptive features in different groups of organisms but toward the same function.

Examples are the eye of the octopus and of mammals and the flippers of Penguins and Dolphins.

Sweet potato (root modification) and potato (stem modification)similarities in proteins and genes performing a given function among diverse organisms give clues to common ancestry.

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

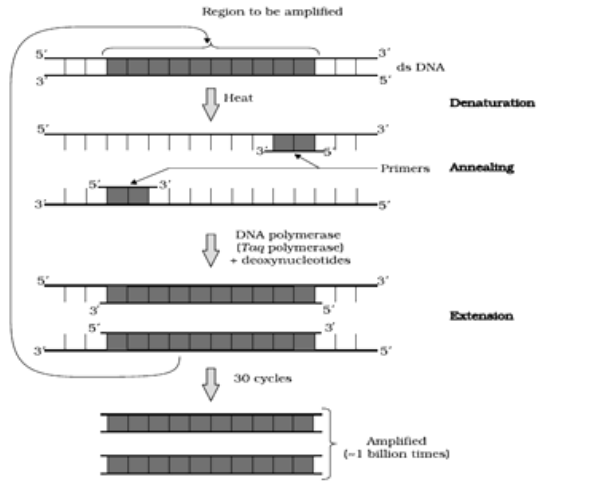
Ionising radiations like X-rays and gamma rays and non-ionizing radiations like UV cause DNA damage leading to neoplastic transformation.

The chemical carcinogens present in tobacco smoke have been identified as a major cause of lung cancer.

Cancer causing viruses called **oncogenic viruses** have genes called **viral oncogenes**.

Furthermore, several genes called **cellular oncogenes** (*c-onc*) or **proto oncogenes** have been identified in normal cells which,when activated under certain conditions, could lead to oncogenic transformation of the cells.

16. It is possible by making use of the PCR.



Polymerase chain reaction (PCR) : Each cycle has three steps: (i) Denaturation; (ii) Primer annealing; and (iii) Extension of primers

PCR stands for **Polymerase Chain Reaction**. In this reaction, multiplecopies of the gene (or DNA) of interest is synthesised*in vitro* using two sets of primers (small chemically synthesised oligonucleotides that are complementary to the regions of DNA) and the enzyme DNA polymerase.The enzyme extends the primers using the nucleotides provided in the reaction and the genomic DNA as template. If the process of replication of DNA is repeated many times, the segment of DNA can be amplified to approximately billion times,

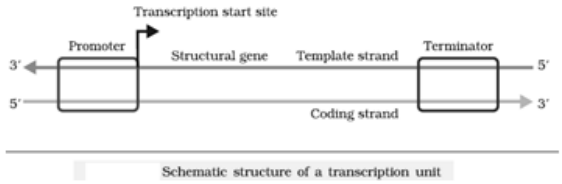
i.e., 1 billion copies are made. Such repeated amplification is achieved by the use of a thermostable DNA polymerase (isolated from a bacterium, *Thermusaquaticus*), which remain active during the high temperature induced denaturation of double stranded DNA. The amplified fragment if desired can now be used to ligate with a vector for further cloning.

17. Plants, bacteria, fungi and animals whose genes have been altered by manipulation are called Genetically Modified Organisms (GMO). GM plants have been useful in many ways. Genetic modification has:
    (i) made crops more tolerant to abiotic stresses (cold, drought, salt,heat).
    (ii) reduced reliance on chemical pesticides (pest-resistant crops).
    (iii) helped to reduce post harvest losses.
    (iv) increased efficiency of mineral usage by plants (this prevents early exhaustion of fertility of soil).
    (v) enhanced nutritional value of food, e.g., Vitamin 'A' enriched rice.
    (vi) create tailor-made plants to supply alternative resources to industries, in the form of starches,fuels and pharmaceuticals.
18. *Agrobacterium tumifaciens*, a pathogen of several dicot plants is able to deliver a piece of DNA known as 'T-DNA' to transform normal plant cells into a **tumor** and direct these tumor cells to produce the chemicals required by the pathogen. The tumor inducing (Ti) plasmid of *Agrobacterium tumifaciens*has now been modified into a cloning vector which is no more pathogenic to the plants but is still able to use the mechanisms to deliver genes of our interest into a variety of plants.
19. Exponential growth equation
    $dN/dt = (b - d) \times N$
    Let (b–d) = r, then
    $dN/dt = rN$
    Where N is population size b is birth rates d is death rates. r is called the intrinsic rate of natural increase.
    Logistic Growth equation:
    $$dN/dt = rN\left(\frac{K - N}{K}\right)$$
    Where N = Population density at time t

r = Intrinsic rate of natural increase

K = Carrying capacity

20. Completed diagram



Schematic structure of a transcription unit

21. Haploid content is 3.3×10^{9}

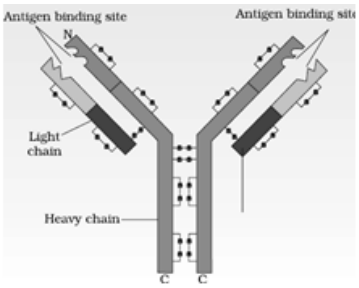
Therefore, diploid content is 6.6×10^{9}

Distance between bp is 0.34×10^{-9}

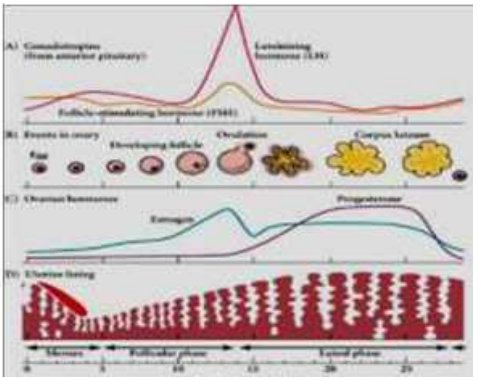
Therefore length is diploid content x distance between bp

$6.6 \times 10^{9} \times 0.34 \times 10^{-9} = 2.24$ m

22. The diagram is of an antibody molecule.



23. a. The parents were traditional but understood the need for such advertisements.



They showed maturity and openness later.

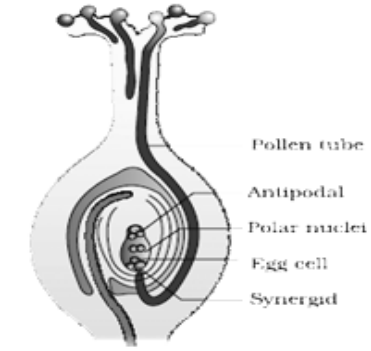
b. i) Menstrual phase

ii) Proliferative phase

iii) Secretory phase

Section D

24.



Longitudinal section of a flower showing growth of pollen tube

Following compatible pollination,the pollen grain germinates on the stigma to produce a pollen tube through one of the germ pores. The contents of the pollen grain move into the pollen tube.Pollen tube grows through the tissues of the stigma and style and reaches the ovary. In plants, where the pollen grains are shed at the two celled stage, the generative cell divides andforms the two male gametes during the growth of pollen tube in the stigma.In plants which shed pollen in the three-celled condition, pollen tubes carry the two male gametes from the beginning. Pollen tube, after reaching the ovary, enters the ovule through the micropyle and then enters one ofthe synergids through the filiform apparatus. filiform apparatus present at the micropylar part of the synergids guides the entry of pollen tube. All these events are together referred to as pollen-pistil interaction.

Or

Endosperm development precedes embryo development.The primary endosperm cell divides repeatedly and forms a triploid endosperm tissue. The cells of this tissue are filled with reserve food materials and are used for the nutrition ofthe developing embryo. In the most common type of endosperm development, the PEN undergoes successivenuclear divisions to give rise to free nuclei. This stage of endosperm development is called free-nuclear endosperm.Subsequently cell wall formation occurs and the endosperm becomes cellular. The number of free nuclei formed before cellularisation varies greatly.

25. The chromosomal disorders are caused due to absence or excess or abnormal arrangement of one or more chromosomes. Failure of segregation of chromatids during cell division cycle resultsin the gain or loss of a chromosome(s), called aneuploidy.

Failure of cytokinesis after telophase stage of cell division results in an increase in a whole set of chromosomes in an organism and is called polyploidy.

Sometimes, either an additional copy of a chromosome may be included in an individual or anindividual may lack one of any one pair of chromosomes. These situations are known as trisomy or monosomy of a chromosome, respectively. Such a situation leads to very serious consequences in theindividual. Down's syndrome, Turner's syndrome, Klinefelter's syndrome are common examples of chromosomal disorders.

Down's Syndrome : The cause of this genetic disorder is the presence of an additional copy of the chromosome number 21 (trisomy of 21).

Klinefelter'sSyndrome : This genetic disorder is also caused due to the presence of an additional copy of X-chromosome resulting into a karyotype of 47, XXY.

Or

The salient observations drawn from human genome project are;

(i) The human genome contains 3164.7 million nucleotide bases.

(ii) The average gene consists of 3000 bases, but sizes vary greatly, with the largest known human gene being dystrophin at 2.4 million bases.

(iii) The total number of genes is estimated at 30,000–much lower than previous estimates of 80,000 to 1,40,000 genes. Almost all (99.9 per cent) nucleotide bases are exactly the same in all people.

(iv) The functions are unknown for over 50 per cent of the discovered genes.

(v) Less than 2 per cent of the genome codes for proteins.

(vi) Repeated sequences make up very large portion of the human genome.

(vii) Repetitive sequences are stretches of DNA sequences that are repeated many times, sometimeshundred to thousand times. They are thought to have no direct coding functions, but they shed light on chromosome structure, dynamics and evolution.

(viii) Chromosome 1 has most genes (2968), and the Y has the fewest (231).

(ix) Scientists have identified about 1.4 million locations where singlebase DNA differences (SNPs–single nucleotide polymorphism, pronounced as 'snips') occur in humans. This informationpromises to revolutionise the processes of finding chromosomal locations fordisease-associated sequences and tracing human history.

26. **Commensalism** - This is the interaction in which one species benefits and the other is neither harmed nor benefited. Examples -

An orchid growing as an *epiphyte* on a mango branch

Barnacles growing on the back of a whale

The cattle egret and grazing cattle

Sea anemone that has stinging tentacles and the clown fish that lives among them.

Mutualism*:* This interaction confers benefits on both the interacting species.

Lichens represent an intimate mutualistic relationship between a fungus and photosynthesising algae or cyanobacteria.

The *mycorrhizae*are associations between fungi and the roots of higher plants.

Plant-animal relationships. Plants need the help of animals for pollinating their flowers and dispersing their seeds- Animals obviously have to be paid 'fees' for the services that plants expect from them. Plants offer rewards or fees in the form of pollen and nectar for pollinators and juicy and nutritious fruits for seed dispersers.

Or

The gradual and fairly predictable change in the species composition of a given area is called**Ecologicalsuccession**. During succession some species colonise an area and their populations become more numerous, whereas populations of other species decline and even disappear. The entire sequence of communities that successively change in a given area are called **sere(s)**. The individual transitional communities are termed seral stages or seral communities. In the successive seral stages there is a change in the diversity of species of organisms, increase in the number of species and organisms as well as an increase in the total biomass. Succession is a process that starts where no living organisms are there – these could be areas where no living organisms ever existed, bare rock; or in areas that somehow, lost all the living organisms that existed there. The former is called primary succession, while the latter is termed secondary succession.

Examples of areas where primary succession occurs are newly cooled lava, bare rock, newly created pond or reservoir. The establishment of a new biotic community is generally slow. Before a biotic community of diverse organisms can become established, there must be soil. Depending mostly on the climate, it takes natural processes several hundred to several thousand years to produce fertile soil on bare rock. Secondary succession begins in areas where natural biotic communities have been destroyed such as in abandoned farm lands, burned or cut forests, lands that have been flooded. Since some soil orsediment is present, succession is faster than primary succession.