CBSE Sample Paper -03

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 is UTR?
2. What are explants?
3. What is the recognition site of EcoRI?
4. Which attribute of human population do the following figures represent?

5. Give the growth equations

Section B

6. What are the basic steps involved in genetically modifying an organism?
7. Explain the four types of barriers of Innate immunity
8. What are the contributions of Sutton and Boveri to Genetics?
9. What are the types of innate immunity?
10. What is meant by meristem culture?

Section C

11. Identify the diagram and the process associated.

Or

Where does syngamy occur?

12. What is meant by 'charging of tRNA? Why does a tRNA have to be charged with an amino acid?
13. What are the complexities involved in transcription of eukaryotic DNA?
14. Diagrammatically represent the genetic basis of blood group inheritance.
15. Life cycle of Plasmodium.
16. What are the advantages of GM plants?
17. What do you understand by the term bio-pesticide? Name and explain the mode of action of a popular bio-pesticide
18. Represent schematically the life cycle of malarial parasite.
19. Compare and contrast: isogamy and anisogamy. With examples.
20. Answer the following.
    a) Expand IUT.
    b) In which part of the female reproductive system the 8 called embryo will be transferred during test tube baby programme.
21. What are baculoviruses?
22. What is downstream processing?
23. **Ratan lives in a remote village. Suddenly he comes to know that his father has arranged the marriage of his younger sister, who is only 14 years old, to a well- to -do middle aged man living in a nearby village. Ratan objected to his father's act. Ratan was not convincedby his father's idea that a better groom might not be available later. Ratan complained to the village head and got the problem solved.**

    a) Did Ratan act properly by approaching the village head? Why/ Why not?

    b) What biological considerations made Ratan object to his father's decision?

    c) What values and responsibilities did Ratan show?

Section D

24. When does the secondary oocyte become an ovum?

Or

Write a detailed note on male gametophyte of plants. Illustrate.

25. Prove the Hardy Weinberg Equation. p = 0.6 q=0.4

$AA(p^2)$	Aa(pq)
Aa(pq)	$Aa(q^2)$

Or

What are the key concepts of Darwin's theory of evolution?

26. What are biogeochemical cycles? Explain the carbon cycle.

Or

What is integrated organic farming?

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Answers

Section A

1. An mRNA has some additional sequences that are not translated and are referred as untranslated regions (UTR). The UTRs are presentat both 5′-end (before start codon) and at 3′-end (after stop codon). Theyare required for efficient translation process.
2. Any part of a plant taken out and grown in a test tube, under sterile conditions in special nutrient media.
3. GAATTC
4. The figures represent the age pyramids of human population as

   Expanding

   Stable and

   Declining
5. The exponential growth equation is

   $N_t = N_0 e^{rt}$

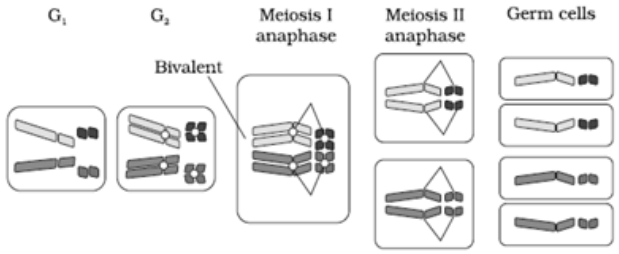
   The logistic growth equation is $dN/dt = rN\left(\frac{K-N}{K}\right)$

Section B

6. Three basic steps in genetically modifying an organism are
   a) Identification of DNA with desirable genes.
   b) Introduction of the identified DNA into the host.
   c) Maintenance of introduced DNA in the host and transfer of the DNA to its progeny.
7. Innate immunity consist of four types of barriers. These are:
   a) Physical barriers: Skin on our body is the main barrier hich prevents entry of the micro-organisms.
   b) Physiological barriers: Acid in the stomach, saliva in the mouth, tears from eyes–all prevent microbial growth.
   c) Cellular barriers: Certain types of leukocytes (WBC) of our body like polymorpho-nuclear leukocytes (PMNL-neutrophils) and monocyte.

d) Cytokine barriers: Virus-infected cells secrete proteins called interferons which protect non-infected cells from further viral infection.

8. Sutton and Boveri noted that the behaviour of chromosomes was parallel to the behaviour of genes and used chromosome movement to explain Mendel's laws.



9. Innate immunity consist of four types of barriers. These are —

a) **Physical barriers :**

- Skin .
- Mucus coating of the epithelium lining the respiratory, gastrointestinal and urogenital tract

b) **Physiological barriers :** Acid in the stomach, saliva in the mouth,tears from eyes

c) **Cellular barriers :**

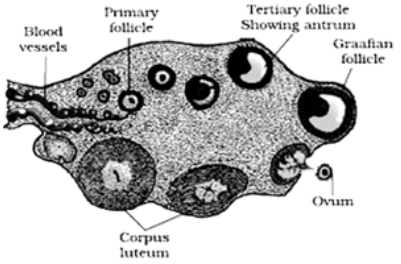
- Certain types of leukocytes (WBC) of our body like polymorpho-nuclear leukocytes (PMNL-neutrophils) and monocytes.
- natural killer (type of lymphocytes) in the blood
- macrophages in tissues can phagocytose and destroy microbes.

d) **Cytokine barriers:** Virus-infected cells secrete proteins called **interferons**which protect non-infected cells from further viral infection.

10. Although the plant is infected with a virus,the meristem (apical and axillary) is free of virus. Hence, one can remove the meristem and grow it *in vitro* to obtain virus-free plants. Scientists have succeeded in culturing meristem of banana, sugarcane, potato, etc.

Section C

11. The diagram is a section of human ovary showing various stages of oogenesis the process of formation of a mature female gamete is called oogenesis

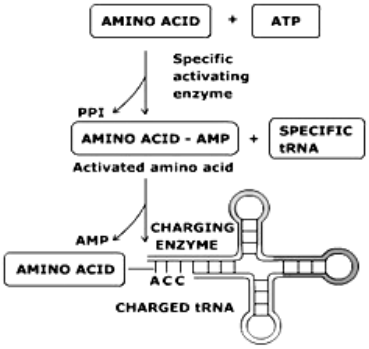


Or

In most aquatic organisms, such as a majority of algae and fishes as well as amphibians,syngamy occurs in the external medium (water), i.e., outside the body of the organism. This type of gametic fusion is called **external fertilisation**. Organisms exhibiting external fertilisation show great synchrony between the sexes and release a large number of gametes into the surroundingmedium (water) in order to enhance the chances of syngamy.

In many terrestrial organisms, belonging to fungi, higher animals such as reptiles, birds, mammals and in a majority of plants (bryophytes, pteridophytes, gymnosperms and angiosperms), syngamy occurs inside the body of the organism, hence the process is called **internal fertilisation.** In all these organisms, egg is formed inside the female body where they fuse with the male gamete. In organisms exhibiting internal fertilisation,the male gamete is motile and has to reach the egg in order to fuse with it.

12.



Amino acids are activated in the presence of ATP and linked to their cognate tRNA–a process commonly called as charging of tRNA or aminoacylation of tRNA. If two such charged tRNAsare brought close enough, the formation of peptide bond between them would be favoured energetically. This helps in translation or the formation of proteins.

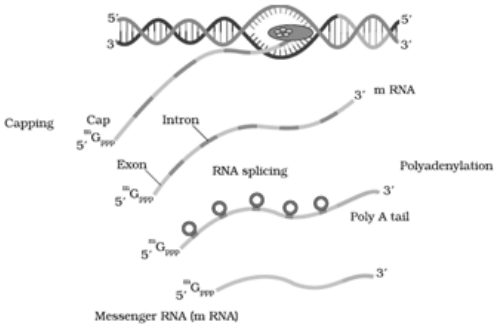
13. Transcription of eukaryotic DNA

a) There are at least three RNA polymerases in the nucleus (in addition to the RNA polymerase found in the organelles)

The RNA polymerase I transcribes rRNAs (28S, 18S, and 5.8S), whereas the RNA polymerase II transcribes precursor of mRNA, the heterogeneous nuclear RNA (hnRNA). RNA polymerase III is responsible for transcription of tRNA, 5srRNA, and snRNAs (small nuclear RNAs).

b) The primary transcripts contain both the exons and the introns and are non-functional. Hence, it is subjected to a process called splicing where the introns are removed and exons are joined in a defined order.

c)

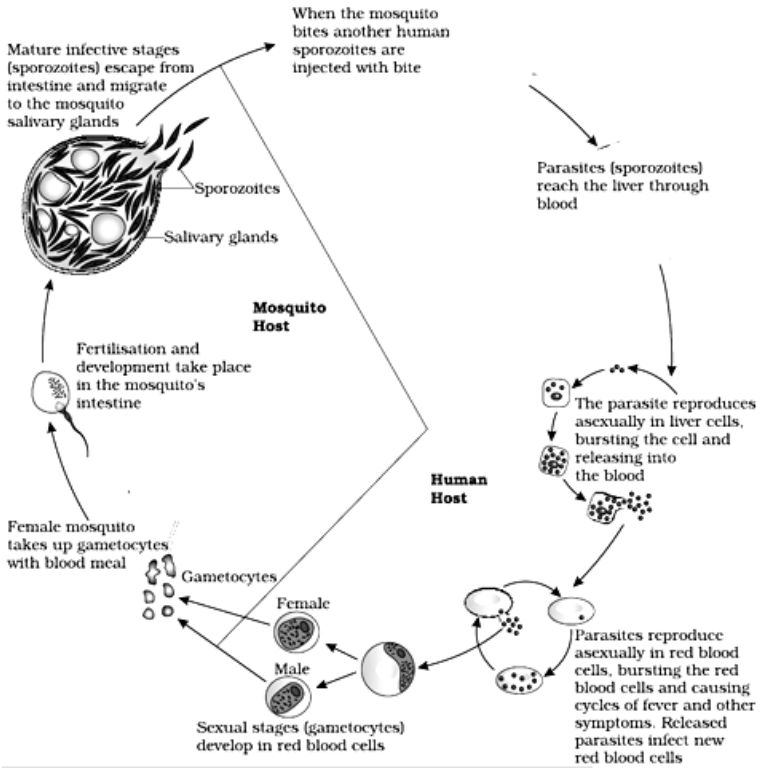


hnRNA undergoes additional processing called as capping and tailing. In capping an unusual nucleotide (methyl guanosine triphosphate) is added to the 5′-end of hnRNA. In tailing, adenylate residues (200-300) are added at 3′-end in a template independent manner. It is the fully processed hnRNA, now called mRNA, that is transported out of the nucleus for translation.

14. The genetic basis of blood group inheritance.

Allele from Parent 1	Allele from Parent 2	Genotype of offspring	Blood types of offspring
I^A	I^A	I^AI^A	A
I^A	I^B	I^AI^B	AB
I^A	i	I^Ai	A
I^B	I^A	I^AI^B	AB
I^B	I^B	I^BI^B	B
I^B	i	I^Bi	B
i	i	ii	O

15. Life cycle of Plasmodium.



16. 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.

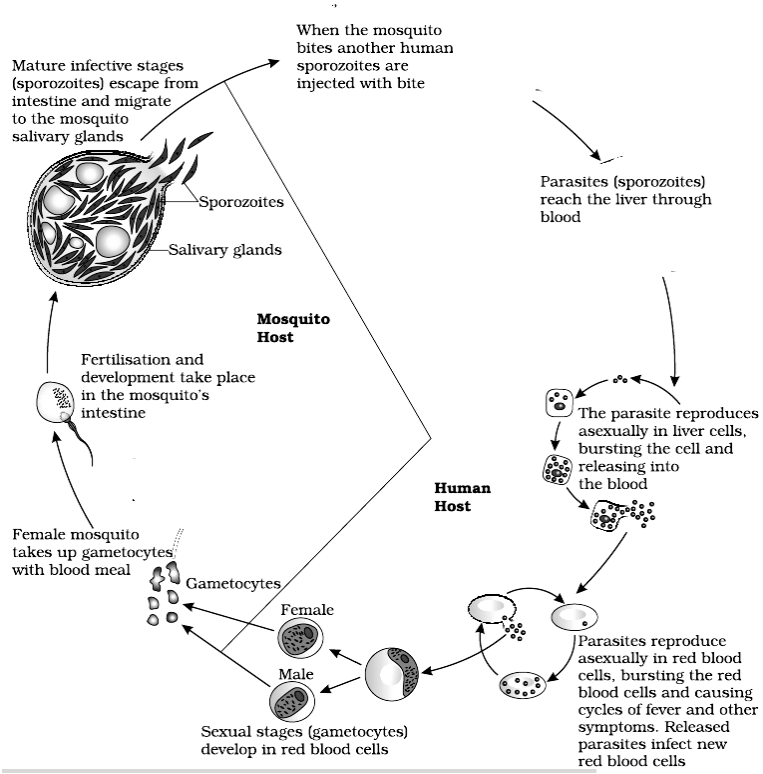
    vi. Create tailor-made plants to supply alternative resources to industries, in the form of starches, fuels and pharmaceuticals.

17. There is a method of controlling pests that relies on natural predation rather than introduced chemicals.

    An example of microbial bio-control agents that can be introduced in order to control butterfly caterpillars is the bacteria *Bacillus thuringiensis* (often written as Bt). These are available in sachets as dried spores which are mixed with water and sprayed onto vulnerable plants such as brassicas and fruit trees, where these are eaten by the insect

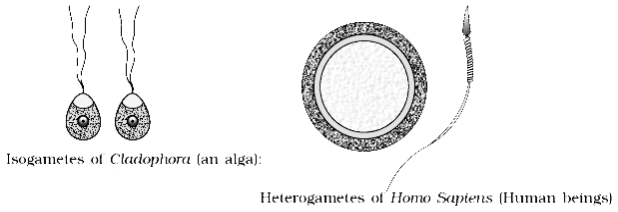
larvae. In the gut of the larvae, the toxin is released and the larvae get killed. The bacterial disease will kill the caterpillars, but leave other insects unharmed. Because of the development of methods of genetic engineering in the last decade or so, the scientists have introduced B. thuringiensis toxin genes into plants. Such plants are resistant to attack by insect pests. Bt-cotton is one such example

18. The life cycle of malarial parasite.



19. In some algae the two gametes are so similar in appearance that it is not possible to categories them into male and female gametes. They are hence called homogametes or isogametes.

In a majority of sexually reproducing organisms the gametes produced are of two morphologically distinct types and are thus heterogametes or anisogametes. In such organisms the male gamete is called the antherozoid or sperm and the female gamete is called the egg or ovum



20.

(a) IUT is Intra Uterine transfer. The 8 celled embryo developed by In-vitro fertilization or ICSI is transferred in this technique.

(b) The 8 celled embryo is transferred to the uterus.

21. Baculoviruses are pathogens that attack insects and other arthropods. The majority of baculoviruses used as biological control agents are in the genus Nucleopolyhedrovirus.

22. After completion of the biosynthetic stage, the product has to be subjected through a series of processes before it is ready for marketing as a finished product. The processes include separation and purification, which are collectively referred to as downstream processing. The product has to be formulated with suitable preservatives. Such formulation has to undergo thorough clinical trials as in case of drugs. Strict quality control testing for each product is also required. The downstream processing and quality control testing vary from product to product.

23. a. Yes, it was necessary to stop the act since as per the government order, the minimum marriageable age of a girl is 18 years.

b. Forced sexual relation and denial of freedom with restriction to family bindings.
Domestic violence
Denial of education
Reproductive health problems
Teenage pregnancy

c. Sense of responsibility and consciousness for his family and respect of government laws. He expressed his views boldly for the right cause.

Section D

24. The process of formation of a mature female gamete is called oogenesis.

- Oogenesis is initiated during the embryonic development stage when a couple of million gamete mother cells (oogonia) are formed within each fetal ovary.

- These cells start division and enter into prophase-I of the meiotic division and get temporarily arrested at that stage, called primary oocytes. Each primary oocyte then gets surrounded by a layer of granulosa cells and is called the primary follicle. A large number of these follicles degenerate during the phase from birth to puberty.
- The primary follicles get surrounded by more layers of granulosa cells and a new theca and are called secondary follicles.
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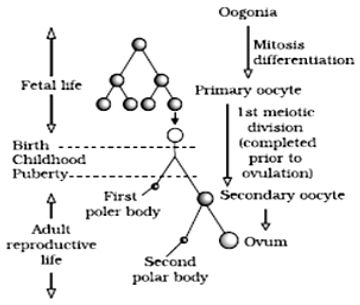


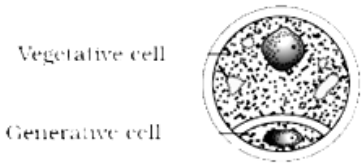
The secondary follicle soon transforms into a tertiary follicle which is characterised by a fluid filled cavity called antrum. The theca layer is organised into an inner theca interna and an outer theca externa. It is at this stage that the primary oocyte within the tertiary follicle grows in size and completes its first meiotic division. It is an unequal division resulting in the formation of a large haploid secondary oocyte and a tiny first polar body. The secondary oocyte retains bulk of the nutrient rich cytoplasm of the primary oocyte. The tertiary follicle further changes into the mature follicle or Graafian follicle .The secondary oocyte forms a new membrane called zona pellucid surrounding it. The Graafian follicle now ruptures to release the secondary oocyte (ovum) from the ovary by the process called ovulation.

- The process of fusion of a sperm with an ovum is called fertilisation.
- During fertilisation, a sperm comes in contact with the *zonapellucida*layer of the ovum and induces changes in the membrane that block the entry of additional sperms. The secretions of the acrosome help the sperm enter into the cytoplasm of the ovum through the zonapellucida and the plasma membrane. This induces the completion of the meiotic division of the secondary oocyte. The second meiotic division is also unequal and results in the formation of a second polar body and a haploid ovum (ootid). Soon the haploid nucleus of the sperms and that of the ovum fuse together to form a diploid zygote.

Or

The male gametophyte of plants are the pollen grains.

- Pollen grains are generally spherical measuring about 25-50 micrometers in diameter.
- It has a prominent two-layered wall.
- The hard outer layer called the **exine**is made up of Sporopollenin.
- Exine has prominent apertures called **germ pores** where sporopollenin is absent.
- The inner wall of the pollen grain is called the **intine.**
- It is a thin and continuous layer made up of cellulose and pectin.
- The cytoplasm of pollen grain is surrounded by a plasma membrane.
- When the pollen grain is mature it contains two cells, the **vegetative cell** and **generative cell.**



- The vegetative cell is bigger, has abundant food reserve and a large irregularly shaped nucleus.
- The **generative cell** is small and floats in the cytoplasm of the vegetative cell.
- It is spindle shaped with dense cytoplasm and a nucleus.
- In over 60 per cent of angiosperms, pollen grains are shed at this 2-celled stage.
- In the remaining species, the generative cell divides mitotically to give rise to the two male gametes before pollen grains are shed (3-celled stage).

25. (a) $p= 0.6 \quad p^2 = 0.36$

$q = 0.4 \quad q^2 = 0.16$

$2pq = 0.48$

Hence, $p^2+2pq+q^2 = 0.36 +0.48 +0.16= 1.$

Or

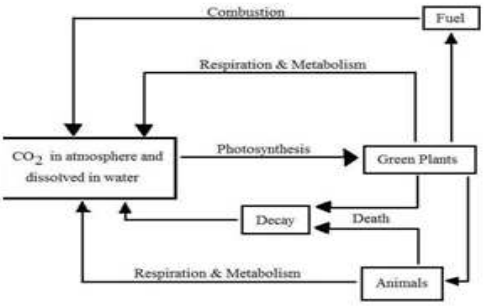
(b) Branching descent and natural selection are the two key concept of Darwinian Theory of Evolution.

darwin's explanation for adaptation (as well as for evolutionary divergence) involves two theses:

- Because of the "Struggle for Existence", few offspring survive to reproduce
- Any heritable variation that improves an individual's ability to survive and reproduce (i.e., its "Fitness") will tend to be passed on to the next generation: "Natural Selection

26. The movement of nutrient elements through the various components of an ecosystem is called **nutrient cycling** or **biogeochemical** cycles.

Nutrient cycles are of two types: (a) **gaseous** and (b) **sedimentary.**



Carbon cycling occurs through atmosphere, ocean and through living and dead organisms. A considerable amount of carbon returns to the atmosphere as CO2 through respiratory activities of theproducers and consumers. Decomposers also contribute substantially to CO2 pool by their processing of waste materials and dead organic matter of land or oceans. Some amount of the fixed carbon is lost to sediments and removed from circulation. Burning of wood, forest fire and combustion of organic matter, fossil fuel, and volcanic activity are additional sources for releasing CO_2 in the atmosphere.

Or

Integrated organic farming is a cyclical, zero-waste procedure, where waste products from one process are cycled in as nutrients for other processes. This allows the maximum utilization of resource and increases the efficiency of production. It includes bee-keeping, dairy management, water harvesting, composting and agriculture in a chain of processes, which support each other and allow an extremely economical and sustainable venture. There is no need to use chemical fertilizers for crops,as cattle excreta (dung) are used as manure. Crop waste is used to create compost, which canbe used as a natural fertilizer or can be used to generate natural gas for satisfying the energy needs of the farm.