

CBSE Sample Paper

(Issued by Central Board of Secondary Education)

Time : 3 Hours

Max. Marks : 70

General Instructions

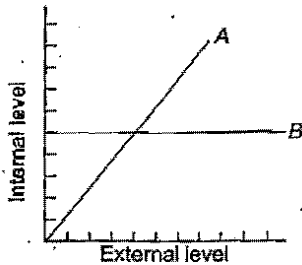
- (i) All questions are compulsory.
- (ii) This question paper consists four sections A, B, C and D. Section A contains 8 questions of 1 mark each, section B is of 10 questions of 2 marks each, section C is of 9 question of 3 marks each and Section D is of 3 question of 5 marks each.
- (iii) There is no overall choice. However, an internal choice has been provided in one question of 2 marks, one question of 3 marks and all the 3 question 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

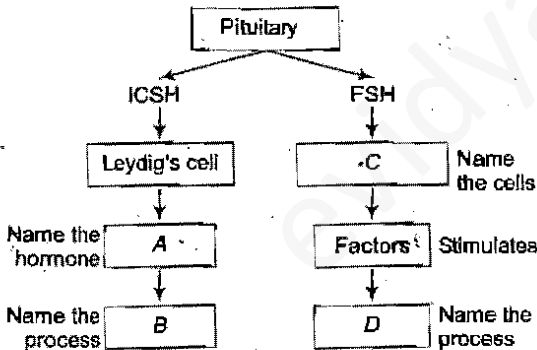
1. Cite an example of an inverted ecological pyramid. What kind of pyramid of energy would it have?
2. When is the structure and composition of a community expected to remain unchanged?
3. At what stage of life is oogenesis initiated in a human female? When does the oocyte complete oogenesis?
4. After a successful *in vitro* fertilization, the fertilized egg begins to divide. Where is this egg transferred before it reaches the 8-cell stage and what is this technique named?
5. AaBb was crossed with aabb. What would be the phenotypic ratio of the progeny? Mention the term to denote this kind of cross.
6. In F Griffith's experiment, how did the non-virulent strain of *Streptococcus pneumoniae* become virulent?
7. State the use of:
 - (a) *Trichoderma* with respect to organ transplant.
 - (b) Nucleopolyhedrovirus with respect to pest management.
8. Bacteria that convert milk into curd play two other beneficial roles. What are they?

Section B

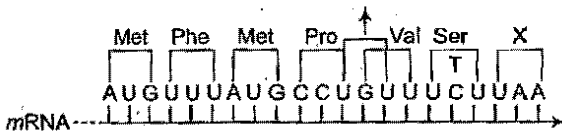
9. Given below is a graph depicting organismic response to changing external condition. According to their response the organisms are grouped into two types. Name the type which will show (a) pattern A and (b) pattern B.



10. Given below is an incomplete flow chart showing influence of hormones on gametogenesis in males. Observe the flow chart carefully and fill in the blanks A, B, C and D.



11. Read the sequence of the nucleotides in the given segment of mRNA and the respective amino acid sequence in the polypeptide chain.



Polypeptide: met-phe-met-proline-valine-serine

- (a) Provide the triplet of bases (codon for (i) Valine (ii) Proline

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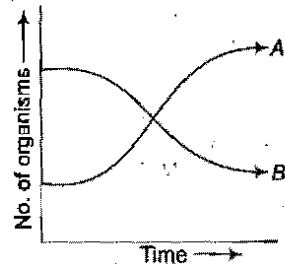
- (b) Write the nucleotide sequence of the DNA strand from which this mRNA was transcribed.
(c) What does the last codon of this RNA stand for?

OR

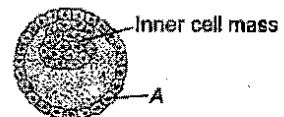
The following table shows the genotypes for ABO blood grouping and their phenotypes. Fill in the gaps left in the table:

Genotype	Blood Group
I ^A I ^A	A
[]	A
I ^B I ^B	B
[]	B
I ^A I ^B	[]
[]	O

12. (a) The graph below represents the growth patterns of two types of aquatic organisms over a brief period of time in a water body surrounded by an agricultural land extensively supplied with fertilizer. Identify the organisms that would represent (i) A and (ii) B.
(b) State the reason for the figure given below and also write the term given to it.



13. Study the figure given below and answer the question that follow.



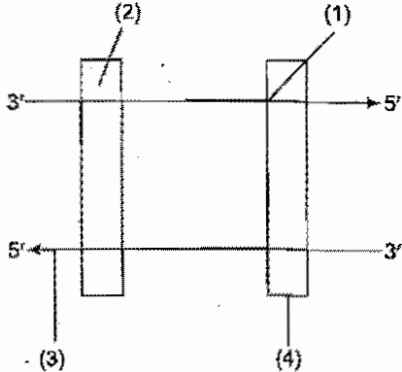
- (a) Name the stage of human embryo the figure represents.

- (b) Identify 'A' in the figure and mention its function.

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- (c) Mention the fate of the inner cell mass after implantation in the uterus.
- (d) Where are the stem cells located in this embryo?
14. Following are the steps in MOET programme for herd improvement in which a cow has been administered hormones with FSH like activity. Arrange steps. (a) to (d) in their correct sequence.
- (a) Transferred to a surrogate mother.
- (b) It is either mated with an elite bull or artificially inseminated.
- (c) Fertilized eggs at 32 cell stage are recovered non-surgically.
- (d) It produces 6-8 eggs instead of one egg which they normally yield per cycle.
15. (a) In which disease is there an uncontrolled division of cells resulting in formation of tumours? How is this disease detected?
- (b) How do interferons help in controlling the disease?
16. State the principle underlying gel electrophoresis and mention two applications of this technique in biotechnology.
17. You have developed a GM organism. Which government organization will you approach to obtain clearance for its mass production? Why is such a body necessary? Give two reasons.
18. A person shows a strong immunogenic reactions, while exposed to certain substances.
- (a) Name this condition and common term for such substances.
- (b) Mention the cell and its chemical which causes this condition.

Section C

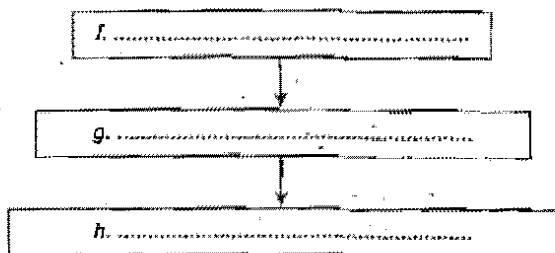
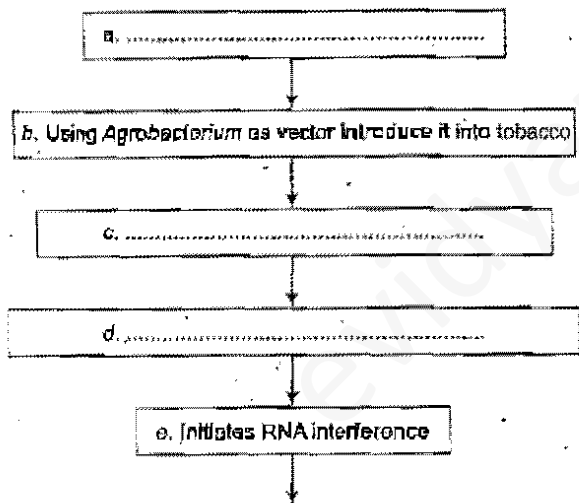
19. Amazonian rain forest has the greatest biodiversity on Earth. List any two hypothesis that are proposed by the biologists to account for the greater biological diversity.
20. (a) In which part of the human female reproductive system do the following events take place?
- (i) Release of 1st polar body.
- (ii) Release of 2nd polar body.
- (iii) Fertilization
- (iv) Implantation
- (b) From where do signals for parturition originate and what does maternal pituitary release for stimulating uterine contraction for child birth?
21. A true breeding tall plant is crossed with a true breeding dwarf plant. F₁ progeny is 100% tall and F₂ has tall: dwarf in the ratio 3:1
- (a) Explain why F₁ shows only one type of parental phenotype.
- (b) Name the patterns of inheritance in which the ratio deviates from above. Also mention the deviated phenotypic ratio.
22. In the following
- 
- (a) Label the parts marked 1 to 4 and state their functions in transcription.
- (b) Which one of the two stands of DNA has nucleotide sequence similar to the mRNA that will be transcribed and why?

23. State in what ways Stanley Miller simulated the condition of
- Primitive atmosphere on Earth.
 - Energy source at the time of origin of life.
 - Formation of organic molecules of life to prove the theory of chemical evolution.

24. Draw a flow chart to depict the multiplication of an HIV virus in a host cell.

25. What are 'flocs'? State their role in effluent treatment and their ultimate fate in sewage treatment tank.

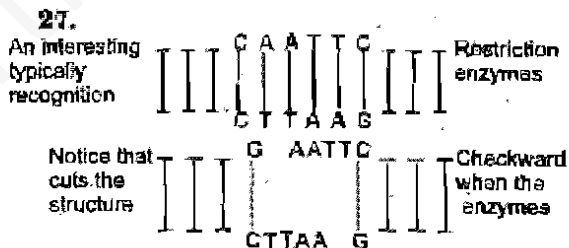
26. Two of the steps involved in producing nematode resistant tobacco plants based on the process of



OR

In a bacterial culture, some of the colonies produced blue colour in the presence of a chromogenic substrate and some did not due to the presence or absence of an insert (rDNA) in the coding sequence of β -galactosidase

- Mention the mechanism and the steps involved in the above experiment.
- How is it advantageous over simultaneous plating on two plates having different antibiotics?



- What is this symmetrical sequence of DNA known as?
- What is the significance of these overhanging chains?
- Name the restriction enzyme that cuts the strand between G and A.

Section D

28. (a) State any two measures taken by the Delhi Government that brought marked improvement in air quality by 2005.
- (b) Name the two fuel-contents which the Euro II norms aim to reduce in fuels.
- (c) What is polyblend? State two points in support of its significance.

How is the 'sixth episode of extinction' of species on Earth, now currently in progress, different from the five earlier episodes? What is it due to? Explain the various causes that have brought about this difference.

29. (a) Draw the embryo sac of a flowering plant and label (i) Central cell (ii) Chalazal end of the embryo sac

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- (b) Name the cell that develops into the embryo sac and explain how this cell leads to the formation of embryo sac.

OR

Show diagrammatically the stages of embryonic development from zygote up to implantation in humans.

30. Name the genes that constitute an operon. How does lac operon get switched on in the presence of lactose?

OR

With the advent of rDNA technology a powerful tool is available to identify a criminal or to the real parents (a) Name this technique. Write the missing steps in the procedure given below. There of three steps are mentioned in the flow chart. Extraction of DNA from the cells - (b)..... (c) DNA is cut into fragments by restriction enzymes (d) (e) (f) (g) Autoradiography (h)

Explanations

1. It can be sea/forest/large tree.
It is upright pyramid of energy.
2. The environment remains unchanged when the community is in near equilibrium.
3. Oogenesis is initiate during the embryonic life in human females. It gets completed. When the sperm enters the egg/at the time of fertilization.
4. The fertilized egg reaches fallopian tube/oviduct. The technique is called ZIFT/zygote intra fallopian transfer.
5. Phenotypic ratio 1 : 1 : 1 : 1. This is called test cross.
6. Bacterial transformation occur by the transfer of genetic material by acquiring genes for smooth coat.
7. (a) *Trichoderma*—Biocontrol agent of several plant pathogens. Produces cyclosporin-A which is used as an immunosuppressive agent in organ transplant patients.
(b) Nucleopolyhedrovirus—Narrow spectrum insecticide.
8. (i) Improves nutritional quality by increasing vitamin-B₁₂.
(ii) Check disease causing microbes in the stomach.
9. (a) Coformers
(b) Regulators

10. A: Androgen/testosterone/male hormone
B: Spermatogenesis
C: Sertoli cells
D: Spermiogenesis

11. (a) (i) GUU
(ii) CCU
(b) TACAAATACGGACAAAGAATT
(c) UAA stands as stop singal.

OR

I^Ai—A blood group I^AI^B—AB blood group
I^Bi—B blood group ii—O blood group

12. (a) (i) Water hyacinth/algal growth
(ii) Fish/aquatic animals
(b) The fertilizers enter the water body which cause more growth of algae and certain plants. This leads to reduction in dissolved oxygen level in water. Due to this, the other aquatic organisms die. The decomposed remains of these dead organisms further deplete the oxygen content of water. The phenomenon is called accelerated eutrophication.
13. (a) Blastocyst.
(b) 'A' trophoblast. It helps in attachment of the blastocyst to the endometrium of uterine wall.
(c) The inner cell mass gets differentiated as the embryo during implantation in uterus.
(d) Stem cells are located in the inner cell mass. They have the potency to give rise to all the tissues and organs.

14. (a) It produces 6-8 eggs instead of one egg which they normally yield per cycle.
 (b) It is either mated with an elite bull or artificially inseminated.
 (c) Fertilized eggs at 32 cell stage are recovered non-surgically.
 (d) Transferred to surrogate mothers.

15. (a) Cancer some techniques to detect cancer are radiography/computerized tomography/magnetic resonance imaging.
 (b) Interferons activate the immune system and help in destroying the cancer cells.

16. Gel electrophoresis is a technique, where charged molecules are separated on the basis of their molecular weight. Gel acts as a sieve.

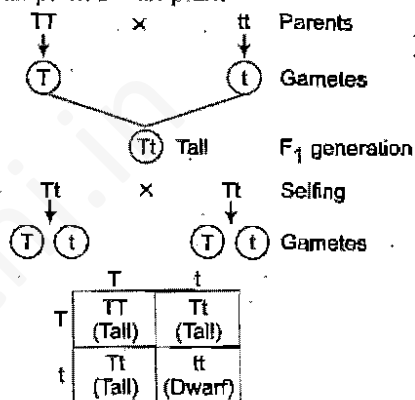
Applications

- (i) Used in rDNA technology or genetic engineering.
 (ii) Useful in DNA fingerprinting.
17. (i) Government organization is Genetic Engineering Approval Committee GEAC.
 (ii) It makes decisions regarding validity of GM research.
 (iii) It checks safety of introducing GM-organisms for public services.
18. (a) This condition is called allergy and substances are allergens.
 (b) Mast cells secrete chemicals like histamine and serotonin which cause allergy.

19. Hypothesis proposed by biologists:
 (i) Speciation is a function of time, unlike temperate regions, tropics have remained relatively undisturbed for millions of years and thus had long evolutionary time for the species diversification.
 (ii) Tropical environments are more constant, predictable and face less seasonal variations. Such constant environments promote niche specialization and lead to a greater species diversity.
 (iii) There is more solar energy available in the tropics leading to higher productivity. This in turn contributes to greater diversity (any two hypothesis).

20. (a) (i) In the ovary.
 (ii) In the isthmus-ampullary junction of fallopian tube.
 (iii) Same as (ii)
 (iv) In the uterus.
 (b) The signals for parturition originate from fully developed foetus and the placenta. Pituitary gland releases oxytocin that stimulates stronger contractions of the uterine muscles.

21. Tall plant Dwarf plant



- (a) F₁ is a hybrid
 Genotype — Tt
 Phenotype — Tall
 The phenomenon is called dominance. In this, one of the parental character is expressed is a hybrid, while the other remains suppressed. The character expressed is called dominant and the other one is called recessive.
- (b) It is the case of incomplete dominance. In this phenomenon, neither of the alleles of a gene is completely dominant over the other and the hybrid is intermediate between the two.
 Genotype and phenotype ratio—1 AA : 2 Aa : 1 aa.

22. (a) 1. **Template strand** Its codes for RNA.
 2. **Promoter** It is a DNA sequence that provides binding site for RNA polymerase for transcription.
 3. **Coding strand** It does not code for any region of RNA.
 4. **Terminator** It defines the end of the transcription process.

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- (b) In coding strand, the sequence of nucleotides will be similar to the RNA transcribed. The template strand codes for RNA, whose sequence will be complementary to that strand. As the coding strand is also complementary to the template strand, it will have a sequence of nucleotides similar to mRNA transcribed.
23. (a) Stanley Miller created primitive atmosphere in a closed flask containing NH_3 , CH_4 , H_2 and water vapour to at 800°C .
- (b) Electric discharge and heating the water chamber to simulated life on primitive Earth. For origin of life.
- (c) Formation of compounds like amino acids from simple molecules like NH_3 , CH_4 , H_2 to prove the theory of chemical evolutions.
24. (a) HIV enters the macrophage (human cell)
- ↓
- (b) Viral RNA genome replicates into DNA with the help of reverse transcription.
- ↓
- (c) Viral DNA is incorporated into host DNA.
- ↓
- (d) Viral DNA directs infected cell to produce viral particles.
- ↓
- (e) Virus comes out while infected cell continues producing HIV particles.
- ↓
- (f) New HIV particles infect helper T-cells which lead to decrease in helper T-cells.
25. Flocs are masses of aerobic bacteria associated with fungal filaments to form mesh-like structures.
- Role in effluent treatment**
- These consume major part of organic matter in the effluent and significantly reduce the biological oxygen demand of the effluent.
- Fate of flocs**
- When effluent goes to settling tank and flocs are allowed to sediment for activated sludge, they get digested by anaerobic bacteria.
26. a- Isolate nematode specific genes.
- c- Produces sense and antisense RNA in the host cells.
- d- Being complementary sense and antisense RNA form double stranded RNA (*dsRNA*).
- f- Silence the specific mRNA of the nematode.
- g- Parasite cannot survive in the transgenic tobacco host expressing RNAi
- h- Thus, the transgenic plant tobacco is protected from nematode.
- OR
- (a) (i) This is called insertional inactivation. In this method, a recombinant DNA is inserted within the coding sequence of an enzyme β -galactosidase. This results in inactivation of the enzyme.
- (ii) If the plasmid of the bacteria does not have an insert, a blue colour develops in the presence of a chromogenic substrate in the medium.
- (iii) The colour does not appear in the presence of insert. They are identified as recombinants.
- (b) It is a simple and easier method of selecting recombinants from non-recombinants. The simultaneous plating method is lengthy and difficult.
27. (a) Palindromic nucleotide sequence/ recognition sequence.
- (b) These are DNA fragments from two different molecules which have the same kind of sticky ends. The overhanging chains can be joined together (end to end) by DNA ligases.
- (c) *Eco RI*
28. (a) Two measures taken by Delhi Government to improve air quality by 2005:
- (i) Switching over the buses from diesel to Compressed Natural Gas (CNG). CNG burns most efficiently. Very little of its burnt remains left, so reducing the air pollution.
- (ii) Phasing out of old vehicles and application of strict pollution-level norms for vehicles. The old vehicles are not efficient in the burning of fuel and liberate smoke and unburnt particles.

- (b) Euro II norms state that sulphur to be controlled at 350 ppm in diesel and 150 ppm in petrol; aromatic hydrocarbons to be contained at 42% of the concerned fuel.
- (c) Polyblend is a fine powder of recycled modified plastic.

Significance

- (i) When mixed with bitumen to pay roads, it increases bitumen's water-repelling properties thereby increasing road life.
- (ii) It helps significantly in plastic waste management as raw material required is any plastic film waste.

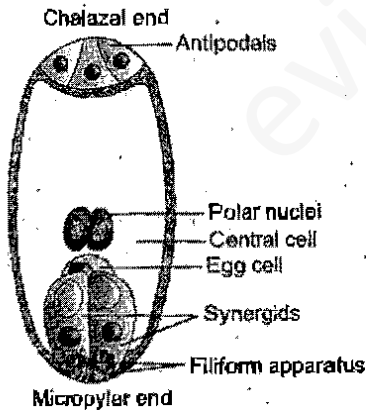
OR

- (i) The difference is that sixth episode of extinction of species on Earth is taking place at a 100 to 1000 times faster than the earlier episodes.
- (ii) It is largely due to human activities.

The various causes are

- (i) Habitat loss and fragmentation occurred due to clearing of forests for farming activities, grazing of animals and pollution caused degradation.
- (ii) Over exploitation of natural resources.
- (iii) Introduction of alien species for specific purpose.

29. (a)



- (b) The functional megaspore develops into embryo sac.

Formation of embryo sac

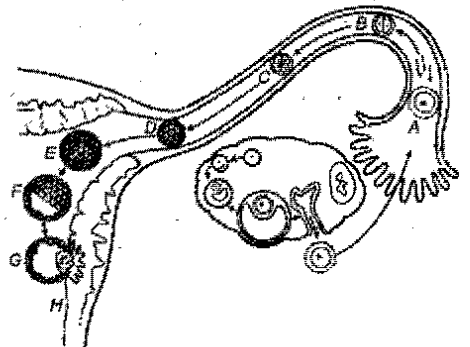
- (i) The functional megaspore enlarges into an oval-shaped embryo sac.
- (ii) Nucleus undergoes mitotic division and the two cells move to the opposite poles forming a 2-nucleate embryo sac.

- (iii) Two successive mitotic divisions occur resulting into an eight nucleate embryo sac.
- (iv) Cell wall formation takes place after nuclear divisions resulting into formation of a typical female gametophyte.
- (v) Three cells group together at the micropylar end-egg apparatus with an egg cell and two synergids.
- (vi) Three cells remain grouped together at the chalazal end. They are called antipodal cells.
- (vii) The remaining two nucleic (one at each end) are called polar nuclei. They move to the centre of the embryo sac and fuse to form a diploid secondary nucleus.
- (viii) A typical angiosperm embryo sac is 8-nucleate and 7-celled.

Specific role of nuclei/cells in embryo sac formation

- (i) The pollen tube enters the embryo sac and discharges the male gametes into the cytoplasm of one to the synergids.
- (ii) Female gamete fuses with one of the male gamete.
- (iii) Secondary nucleus fuses with another male gamete and forms primary endosperm nucleus.
- (iv) The antipodal cells and synergids later degenerate.

OR



- A—Zygote
 B—2-celled stage cleavage
 C—4 celled stage cleavage
 D—Morula with vitelline membrane
 E—Blastocyst with trophoblast and inner cell mass
 F—Implantation of blastocyst
 G—Blastocyst in the endometrium wall
 H—Placenta and embryo implanted

Sample Paper

30. The components of *lac* operon are regulator gene promoter gene, operator gene and structural genes.

lac operon 'switched on' in presence of lactose:

- (i) An inducible operon, where lactose induces the substrate for the enzyme β -galactosidase.
- (ii) Three structural genes (γ , z , a) transcribe the polycistronic mRNA.
- (iii) z codes for galactosidase, γ for permease and a for transacetylase.
- (iv) Near the structural genes is the promoter gene, where RNA polymerase binds for transcription.
- (v) An operator gene lies as a switch near the promoter, where a repressor always binds.
- (vi) Repressor protein coded by the i gene prevents the RNA polymerase from transcribing by binding to the operator.
- (vii) Lactose an inducer inactivates the repressor and prevents it from binding to the operator.

(viii) It allows an access for the RNA polymerase to the promoter.

(ix) Transcription takes place.

(x) Lactose interacts with repressor and render them inactive so that repressor releases the operator region. As a result, the RNA polymerase binds to the promoter and 'switch on', the operon for transcription of *lac* mRNA.

OR

(b) The technique is called DNA fingerprinting.

(d) Amplification by polymerase chain reaction.

(e) Separation of DNA fragments by gel electrophoresis.

(f) Southern blotting.

(g) Hybridization using probe fragment.

(h) Matching of DNA fragment photographs and interpretation.