

| Ch. No.                              | Title   | Marks Per Unit | Section-A (1 marks) |  |  |  |  | Section-B (2 marks) |  |  |  |  | Section-C (3 marks) |  |  |  |  | Section-D (4 marks)  |  |  |  |  | Section-E (5 marks) |  |  |  |  | Total Marks   |
|--------------------------------------|---|----------------|---------------------|--|--|--|--|---------------------|--|--|--|--|---------------------|--|--|--|--|----------------------|--|--|--|--|---------------------|--|--|--|--|---------------|
|                                      |   |                | MCQ & A/R Ques. No. |  |  |  |  | VSA Ques. No.       |  |  |  |  | SA Ques. No.        |  |  |  |  | Case based Ques. No. |  |  |  |  | LA Ques. No.        |  |  |  |  |               |
| 1                                    | Reproduction in organisms                     | 16             | 1(Q3)               |  |  |  |  | 1(Q21)              |  |  |  |  |                     |  |  |  |  |                      |  |  |  |  |                     |  |  |  |  | 3             |
| 2                                    | Sexual Reproduction in Flowering Plants       |                |                     |  |  |  |  |                     |  |  |  |  | 1(Q23)              |  |  |  |  |                      |  |  |  |  | 1(Q31)              |  |  |  |  | 8             |
| 3                                    | Human Reproduction                            |                |                     |  |  |  |  | 1(Q19)              |  |  |  |  |                     |  |  |  |  |                      |  |  |  |  |                     |  |  |  |  | 2             |
| 4                                    | Reproductive Health                           |                |                     |  |  |  |  |                     |  |  |  |  | 1(Q22)              |  |  |  |  |                      |  |  |  |  |                     |  |  |  |  | 3             |
| 5                                    | Principles of Inheritance and Variation       | 20             | 3(Q11, 12, 13)      |  |  |  |  |                     |  |  |  |  | 1(Q27)              |  |  |  |  |                      |  |  |  |  | 1(Q32)              |  |  |  |  | 11            |
| 6                                    | Molecular Basis of Inheritance                |                | 2(Q10, 14)          |  |  |  |  | 1(Q18)              |  |  |  |  |                     |  |  |  |  |                      |  |  |  |  |                     |  |  |  |  | 4             |
| 7                                    | Evolution                                     |                | 2(Q1, 9)            |  |  |  |  |                     |  |  |  |  | 1(Q28)              |  |  |  |  |                      |  |  |  |  |                     |  |  |  |  | 5             |
| 8                                    | Human Health and Disease                      | 12             | 2(Q15, 16)          |  |  |  |  | 1(Q20)              |  |  |  |  |                     |  |  |  |  |                      |  |  |  |  |                     |  |  |  |  | 4             |
| 9                                    | Strategies for enhancement in food production |                |                     |  |  |  |  |                     |  |  |  |  | 1(Q26)              |  |  |  |  |                      |  |  |  |  |                     |  |  |  |  | 3             |
| 10                                   | Microbes in Human Welfare                     |                | 1(Q2)               |  |  |  |  |                     |  |  |  |  |                     |  |  |  |  | 1(Q30)               |  |  |  |  |                     |  |  |  |  | 5             |
| 11                                   | Biotechnology-Principles and Processes        | 12             | 2(Q5, 6)            |  |  |  |  | 1(Q17)              |  |  |  |  | 2(Q24, 25)          |  |  |  |  |                      |  |  |  |  |                     |  |  |  |  | 10            |
| 12                                   | Biotechnology and its Application             |                | 2(Q4, 7)            |  |  |  |  |                     |  |  |  |  |                     |  |  |  |  |                      |  |  |  |  |                     |  |  |  |  | 2             |
| 13                                   | Organisms and Populations                     | 10             | 1(Q8)               |  |  |  |  |                     |  |  |  |  |                     |  |  |  |  |                      |  |  |  |  |                     |  |  |  |  | 1             |
| 14                                   | Ecosystem                                     |                |                     |  |  |  |  |                     |  |  |  |  |                     |  |  |  |  |                      |  |  |  |  |                     |  |  |  |  |               |
| 15                                   | Biodiversity and conservation                 |                |                     |  |  |  |  |                     |  |  |  |  |                     |  |  |  |  | 1(Q29)               |  |  |  |  | 1(Q33)              |  |  |  |  | 9             |
| 16                                   | Environmental issues                          |                |                     |  |  |  |  |                     |  |  |  |  |                     |  |  |  |  |                      |  |  |  |  |                     |  |  |  |  | 0             |
| <b>Total Marks (Total Questions)</b> |   |                | <b>16(16)</b>       |  |  |  |  | <b>10(5)</b>        |  |  |  |  | <b>21(7)</b>        |  |  |  |  | <b>8(2)</b>          |  |  |  |  | <b>15(3)</b>        |  |  |  |  | <b>70(33)</b> |

**NOTE:** The number given inside the bracket denotes question number, ask in the sample paper, while the number given outside the bracket are the number of questions from that particular chapter.



**Time Allowed : 3 Hours**

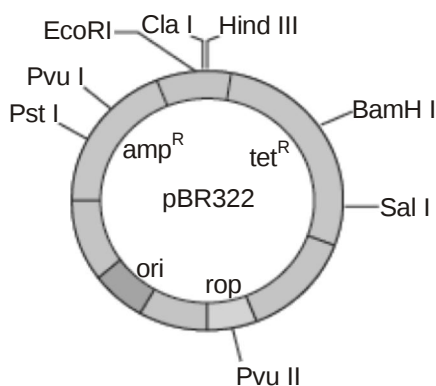
**Max. Marks : 70**

**General Instructions**

- All questions are compulsory.
- The question paper has five sections and 33 questions. All questions are compulsory.
- Section–A has 16 questions of 1 mark each; Section–B has 5 questions of 2 marks each; Section–C has 7 questions of 3 marks each; Section–D has 2 case-based questions of 4 marks each; and Section–E has 3 questions of 5 marks each.
- There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.
- Wherever necessary, neat and properly labeled diagrams should be drawn.

**SECTION-A**

- Atmosphere of earth just before the origin of life consisted of:
  - water vapours, CH<sub>4</sub>, NH<sub>3</sub> and oxygen.
  - CO<sub>2</sub>, NH<sub>3</sub>, and CH<sub>2</sub>
  - CH<sub>4</sub>, NH<sub>3</sub>, H<sub>2</sub> and water vapours.
  - CH<sub>4</sub>, O<sub>3</sub>, O<sub>2</sub> and water vapours.
- Methanogenic bacteria are present in
  - anaerobic sludge
  - rumen (a part of stomach) of cattle
  - both (a) and (b)
  - None of these
- Asexual reproduction is common among
  - single celled organisms only.
  - plants only.
  - animals with simple organization.
  - single celled animals, plants and animals with simple organizations.
- The trigger for activation of toxin of *Bacillus thuringiensis* is
  - acidic pH of stomach
  - high temperature
  - alkaline pH of gut
  - mechanical action in the insect gut
- The figure below is the diagrammatic representation of the *E. Coli* vector pBR 322. Which one of the given options correctly identifies its certain component (s)?



- ori - original restriction enzyme
  - rop-reduced osmotic pressure
  - Hind III, EcoRI - selectable markers
  - ampR, tetR - antibiotic resistance genes
- The polymerase enzyme used in PCR is
    - DNA polymerase I
    - Taq polymerase
    - reverse transcriptase
    - restriction endonuclease
  - C-peptide of human insulin is
    - a part of mature insulin molecule
    - responsible for the formation of disulphide bridges
    - removed during maturation of pro-insulin to insulin
    - responsible for its biological activity
  - The term 'precipitation' includes
    - rain
    - snow
    - Both (a) and (b)
    - None of them

9. Who proposed that the first form of life come from pre-existing non- living molecules?
  - (a) Oparin and Haldane
  - (b) de Vries and Sturtevant
  - (c) Darwin and Lamarck
  - (d) Louis Pasteur and Miller
10. Which one of the following pair is a purine pair?
  - (a) Uracil, Guanine
  - (b) Cytosine, Thymine
  - (c) Adenine, Guanine
  - (d) Adenine, Thymine
11. The law of segregation of characters postulated by Mendel can be related to
  - (a) the presence of two genes for each character in a somatic cell.
  - (b) a gamete receiving only one of the two homologous chromosomes during gamete formation.
  - (c) presence of both genes on the same chromosome.
  - (d) None of the above
12. Which of the following statement confirm the law of dominance
  - (a) 3:1 ratio in F<sub>2</sub> generation
  - (b) It is the conclusion of a dihybrid cross
  - (c) Alleles do not show any blending and both characters recovered as such in F<sub>2</sub> generation
  - (d) Alleles of a pair segregate from each other such that gamete receives only one of the two factors

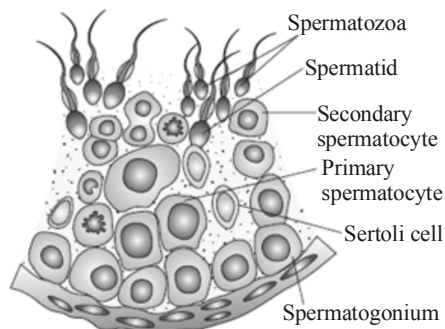
**Directions: Q.No. 13–16:** Consist of two statements–Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

- (a) Both A and R are true and R is the correct explanation of A.
- (b) Both A and R are true and R is not the correct explanation of A.
- (c) A is true but R is false.
- (d) A is False but R is true.

13. **Assertion:** Hybrid is formed by cross between two organisms that are different in one or more traits.  
**Reason:** Mendel crossed two plants differing in one trait to obtain F<sub>1</sub> plants in monohybrid cross.
14. **Assertion:** Replication and transcription occur in the nucleus but translation takes place in the cytoplasm.  
**Reason:** mRNA is transferred from the nucleus into cytoplasm where ribosomes and amino acids are available for protein synthesis.
15. **Assertion:** An antibody is a protein molecule made by the lymphocytes.  
**Reason:** An antibody binds to a specific antigen and neutralizes its odd effects.
16. **Assertion:** Phagocyte cells digest microbes and debris  
**Reason:** Natural killer cells destroy virus-infected cells and tumor cells.

### SECTION-B

17. State the role of 'biolistic gun' in biotechnology experiments. Microparticles of which elements are used in this technique?
18. A region of a coding DNA strand has the following nucleotide sequence: -ATGC-  
What shall be the nucleotide sequence in the following?
  - (i) Sister DNA segment it replicates.
  - (ii) m-RNA polynucleotide it transcribes.
19. Refer the figure of a part of seminiferous tubule showing different stages of sperm formation and answer the questions.



- (a) Describe the process of spermatogenesis up to the formation of spermatozoa.
- (b) Trace the path of spermatozoa from the testes up to the ejaculatory duct only.



20. Define the term 'health'. Mention any two ways of maintaining it.

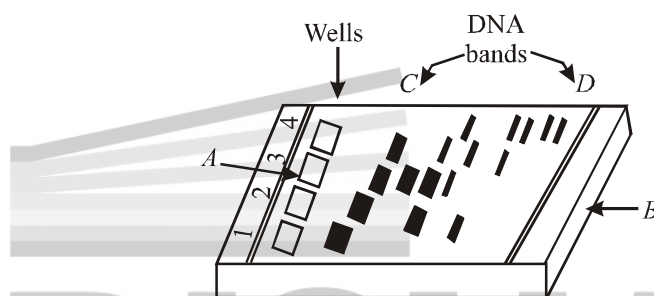
**OR**

Microbes play a dual role when used for sewage treatment as they not only help to retrieve usable water but also generate fuel. Write in points how this happens?

21. Cucurbits and papaya plants bear staminate and pistillate flowers. Mention the categories they are put under separately on the basis of the type of flowers they bear.

### SECTION-C

22. A large number of married couples in the world are childless. It is shocking to know that in India the female partner is often blamed for the couple being childless.
- State any two reasons responsible for the cause of infertility in case of male and female.
  - Suggest a technique that can help the couple to have a child where the problem is with male.
23. Name the organic materials exine and intine of an angiosperm pollen grains are made up of. Explain the role of exine.
24. Explain stirring type bioreactors.
25. Study the diagram given below and answer the following questions.



- Why have DNA fragments in band D moved far away in comparison to those in band C?
  - Identify the anode end in the diagram.
  - How are these DNA fragments visualised.
26. Scientists have succeeded in recovering healthy sugarcane plants from a diseased one.
- Name the part of the plant used as explant by scientists.
  - Describe the procedure the scientists followed by recover the healthy parts.
  - Name the technology used for crop improvement.
27. (a) State the cause and symptoms of Down's syndrome. Name and explain the event responsible for causing this syndrome.  
(b) Haemophilia and Thalassemia are both examples of Mendelian disorder, but show difference in their inheritance pattern. Explain how.
28. Name the ancestors of man based on the features given below:
- Human like, meat-eater with 900 cc brain, lived in Java.
  - More human with brain size 1400 cc, lived in central Asia, used hides and buried their dead.
  - Human like, vegetarian, with brain capacity between 650 cc and 800 cc.

### SECTION-D

29. Read the following and answer any four questions from 29(i) to 29(iii) given below:

**Ex-Situ Conservation:**

In this approach, threatened animals and plants are taken out from their natural habitat and placed in special setting where they can be protected and given special care. Zoological parks, botanical gardens and wildlife safari parks serve this purpose. There are many animals that have become extinct in the wild but continue to be maintained in zoological parks. In recent years ex situ conservation has advanced beyond keeping threatened species in enclosures.

Now gametes of threatened species can be preserved in viable and fertile condition for long periods using cryopreservation techniques, eggs can be fertilised in vitro, and plants can be propagated using tissue culture methods. Seeds of different genetic strains of commercially important plants can be kept for long periods in seed banks.

Biodiversity knows no political boundaries and its conservation is therefore a collective responsibility of all nations. The historic Convention on Biological Diversity ('The Earth Summit') held in Rio de Janeiro in 1992, called upon all nations to take appropriate measures for conservation of biodiversity and sustainable utilisation of its benefits.

In a follow-up, the World Summit on Sustainable Development held in 2002 in Johannesburg, South Africa, 190 countries pledged their commitment to achieve by 2010, a significant reduction in the current rate of biodiversity loss at global, regional and local levels.

- (i) What was the outcome of the 1992 Earth Summit in Rio de Janeiro?
- (ii) Which method is used to preserve gametes of threatened species in viable and fertile condition?

**OR**

Which one of the following is related to ex-situ conservation of threatened animals and plants?

- (iii) List any four techniques where the principle of ex situ conservation of biodiversity has been employed. What are seed banks used for?
30. Read the following and answer any four questions from 30(i) to 30(iii) given below:

**Microbes in commercial production of Chemicals, enzymes and Bioactive molecule:**

Microbes are also used for commercial and industrial production of certain chemicals like organic acids, alcohols and enzymes. Examples of acid producers are *Aspergillus niger* (a fungus) of citric acid, *Acetobacter aceti* (a bacterium) of acetic acid; *Clostridium butylicum* (a bacterium) of butyric acid and *Lactobacillus* (a bacterium) of lactic acid. Yeast (*Saccharomyces cerevisiae*) is used for commercial production of ethanol. Microbes are also used for production of enzymes.

Lipases are used in detergent formulations and are helpful in removing oily stains from the laundry. You must have noticed that bottled fruit juices bought from the market are clearer as compared to those made at home. This is because the bottled juices are clarified by the use of pectinases and proteases.

Streptokinase produced by the bacterium *Streptococcus* and modified by genetic engineering is used as a 'clot buster' for removing clots from the blood vessels of patients who have undergone myocardial infraction leading to heart attack. Another bioactive molecule, cyclosporin A, that is used as an immunosuppressive agent in organ-transplant patients, is produced by the fungus *Trichoderma polysporum*. Statins produced by the yeast *Monascus purpureus* have been commercialised as blood-cholesterol lowering agents. It acts by competitively inhibiting the enzyme responsible for synthesis of cholesterol.

- (i) Which organism has been commercialised as blood cholesterol lowering agent?
- (ii) Why bottled fruit juices bought from the market are clearer as compared to those made at home?

**OR**

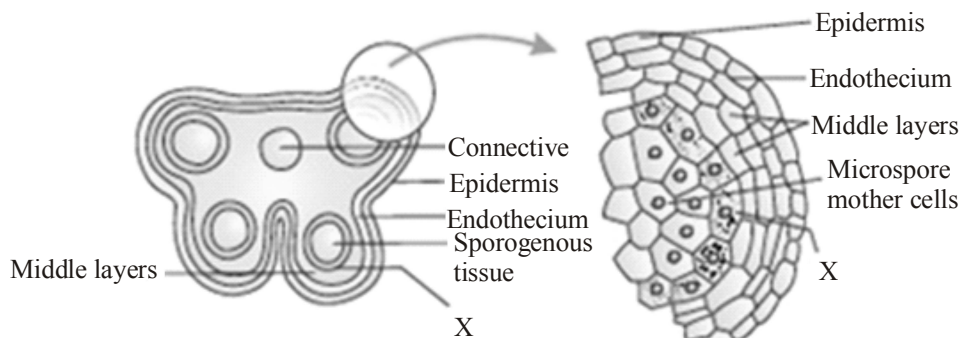
Name the fungus of citric acid.

- (iii) Identify a, b, c, d, e and f, g, h in the given table below

| Organism                     | Bioactive Molecule | Use         |
|------------------------------|--------------------|-------------|
| 1. <i>Monascus purpureus</i> | a                  | b           |
| 2. c                         | d                  | Antibiotic  |
| 3. e                         | Cyclosporin A      | f           |
| 4. g                         | h                  | Clot buster |

**SECTION-E**

31. (a) "X" part in the given diagram plays an important role in the formation of pollen grain wall. Identify "X" and explain its role in the formation of pollen grain wall.

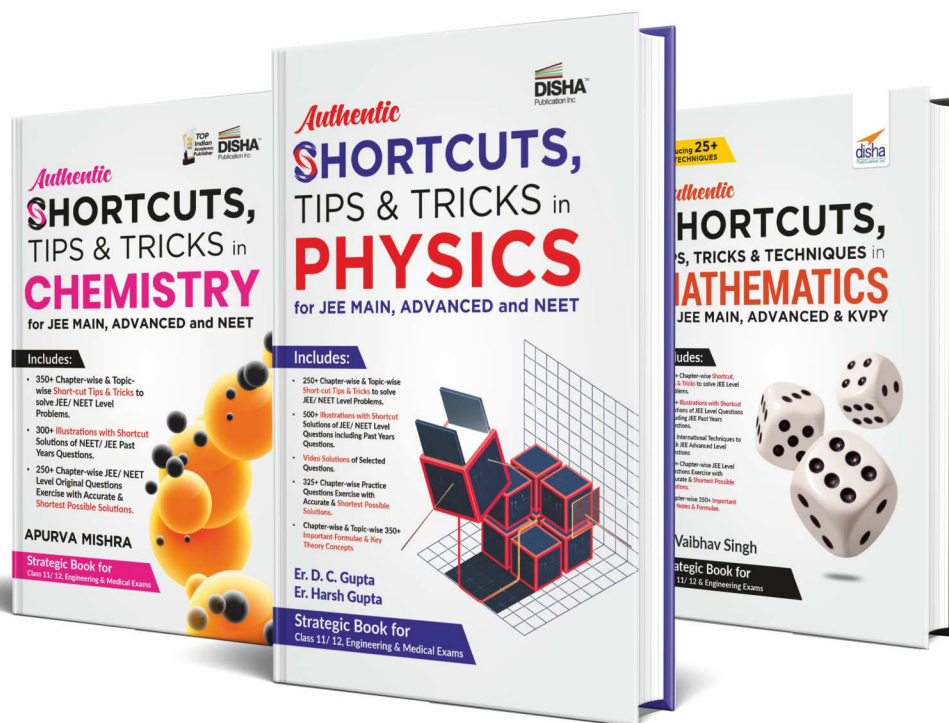


- (b) Describe the characteristics of flowers that are pollinated by wind.
- (c) Identify and explain the stage (given below) involved in post-fertilisation event of flowering plants.
  - (i) Transfer of pollen grains

# No Matter

## Where you PREPARE from! This book will be your COMPANION

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- In all the Book covers Chapter-wise & Topic-wise Shortcuts, Tips & Tricks, Illustrations with shortcut solutions, Chapter-wise JEE level original Questions Exercise & Quick Revision Material.
- Apart from Tips and Tricks, this book comprises a lot of interesting misconceptions which are not mentioned in any book available in Indian market.
- Most of the problems in Illustrations are taken from Previous Year Questions to demonstrate students how these can be easily solved by using various Tips and Tricks.
- The author has also tried to cover all the major Concepts through these problems.
- Questions in Exercises are original and the author has tried to put Higher Difficulty Level Questions, which pose a difficulty to the students.
- The reader is advised to go through the Chapter before attempting the Exercise part.
- Detail calculations are skipped (can be verified) for "Concept Booster Exercise" which is not an important matter for this book.



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- (ii) Embryo development
- (iii) Formation of flower
- (iv) Formation of pollen grains

**OR**

- (a) Explain the menstrual phase in a human female. State the levels of ovarian and pituitary hormones during this phase.
  - (b) Why is follicular phase in the menstrual cycle also referred as proliferative phase? Explain.
  - (c) Explain the events that occur in a graafian follicle at the time of ovulation and thereafter.
- 32.** (a) Why are thalassemia and haemophilia categorized as Mendelian disorders ? Write the symptoms of these diseases. Explain their pattern of inheritance in humans.
- (b) Write the genotypes of the normal parents producing a haemophilic son.

**OR**

Describe the experiment that helped demonstrate the semi-conservative mode of DNA replication.

- 33.** How is biodiversity at all levels generally conserved ?

**OR**

What kind of threat to biodiversity may lead to its loss ?

# SOLUTIONS

## SAMPLE PAPER-1

1. (c) The primitive atmosphere was reducing due to lack of **free molecular oxygen**. The early atmosphere contained ammonia (NH<sub>3</sub>), water vapour (H<sub>2</sub>O), hydrogen (H<sub>2</sub>), methane (CH<sub>4</sub>). (1 Mark)
2. (c) Methanobacterium, a common bacteria of methanogens, is found in the anaerobic sludge during sewage treatment and rumen of cattle (for cellulose digestion). (1 Mark)
3. (d) Asexual reproduction does not involve meiosis, ploidy reduction or fertilization, and the offspring is a clone of the parent organism because of no exchange of genetic material. Asexual reproduction is the primary form of reproduction for single-celled organisms such as the archaeobacteria, eubacteria, and protists. Many plants and fungi reproduce asexually as well. (1 Mark)
4. (c) Bt toxins are inactive protoxins but after ingested by the insect, these inactive toxin becomes active, due to the alkaline pH of the gut, that solublise the crystals. Hence, high pH value is required to make Bt toxins active. Under high temperature and acidic pH, Bt toxins remain insoluble and inactive. (1 Mark)
5. (d) In pBR 322 ori-represents site of origin or replication rop-represents those proteins that take part in replication of plasmid. Hind III, EcoRI- Recognition sites of Restriction endonucleases ampR and tetR - They are antibiotic resistant gene part. (1 Mark)
6. (b) The enzyme used in PCR is Taq polymerase. Taq polymerase (isolated from bacterium thermus aquaticus) which remains active during the high temperature, usually amplifies DNA segments of upto 2 kb. (1 Mark)
7. (c) C-peptide or the connecting peptide is a short street of protein contains 31 amino acids. It connects the A and B chain of proinsulin molecule. After the processing of proinsulin molecule, C-peptide is removed leaving behind A and B chains which later bound together by disulphide bonds to constitute a mature insulin molecule. (1 Mark)
8. (c) Precipitation includes both rain and snow. (1 Mark)
9. (a) Oparin of Russia and Haldane of England proposed that the first form of life could have come from pre-existing non- living molecules (eg, RNA, protein etc. and that formation of life was preceded by chemical evolution i.e. formation of diverse organic molecule from inorganic molecules. (1 Mark)
10. (c) DNA (deoxyribose nucleic acid) consists of 3 different molecules-phosphate, 5-carbon deoxyribose sugar and nitrogenous base. The nitrogenous base may be a 9-membered, double purine, i.e., adenine (A) or guanine (G), or a 6-membered, single -ringed pyrimidine, i.e., thymine (T) or cytosine (C). (1 Mark)
11. (b) The law of segregation of characters postulated by Mendel can be related to a gamete receiving only one of the two homologous chromosomes during meiosis. (1 Mark)
12. (a) The law of dominance shows 1 : 3 ratio in its F<sub>2</sub> generation. (1 mark)
13. (b) Hybrid is the offspring of two plants or animals of different species or varieties. A monohybrid cross is a mating between two organisms with different variations at one genetic chromosome of interest. One parent having two dominant alleles and the other two recessives. All the offspring have one dominant and one recessive allele for that gene.  
Hence, Mendel crossed two plants differing in one trait to obtain F1 plants which is monohybrid cross. (1 mark)
14. (a) Replication and transcription takes place in the nucleus and translation occurs in the cytoplasm. During translation, m-RNA is transferred from the nucleus into the cytoplasm where ribosomes and amino acids are available for the process of protein synthesis. (1 Mark)
15. (b) Antibodies are made by B- lymphocytes with the help of T- helper cells in response to specific antigen. Antibody neutralizes the effect of foreign antigen. So the correct option is "Both Assertion and Reason are correct but Reason is not the correct explanation of Assertion". (1 mark)
16. (b) (1 mark)
17. • Biolistic gun (also called gene gun) is a technique of genetic engineering which is mostly used in plant biotechnology. Gene gun is commonly used to insert the genetic material into the plant cells by the particles coated into small DNA sequences.  
• High velocity microparticles of gold and tungsten are used in this technique. These are used as 'bullets' to deliver DNA into callus cells. (1 + 1 Marks)
18. (i) -TACG-  
(ii) -AUGC- (1 + 1 Marks)
19. (a) • Spermatogenesis is the sequence of events by which spermatogonia are transformed into mature sperms. This maturation process begins at puberty.  
• After several mitotic divisions, the spermatogonia grow and undergo changes. Spermatogonia are transformed into primary spermatocytes, the largest germ cells in the seminiferous tubules.  
• Each primary spermatocyte subsequently undergoes 1st meiotic division (reduction division) to form two haploid secondary spermatocytes, which are approximately half the size of primary spermatocytes. Secondary spermatocytes then undergo a second meiotic division to form four haploid spermatids.  
• These haploid spermatids are approximately half the size of secondary spermatocytes. The spermatids are gradually transformed into four mature sperm by a process known as spermiogenesis.  
(b) Seminiferous tubule → Rete testes → Vasa efferentia → Epididymis → Vas deferens → Ejaculatory duct. (4 × ¼ + 1 Marks)

20. Health can be defined as a state of complete physical, mental and social well being. Good health can be achieved by taking balanced diet, maintaining personal hygiene, regular exercise/yoga, vaccination against infectious diseases, etc. (2 Marks)

**OR**

Before disposal, the sewage is treated in sewage treatment plants. Microbes present naturally in the sewage help in its treatment. Alongwith sewage treatment they also help to generate fuel. (any four)

- (i) Primary treatment – Physical removal of particles leading to sludge formation.
- (ii) Secondary treatment – Carried out by microbes which reduce biochemical oxygen demand of effluent.
- (iii) Formation of activated sludge.
- (iv) In anaerobic sludge digesters other bacteria digest bacteria and fungi present in the sludge.
- (v) Bacteria produces a mixture of gases like methane, hydrogen sulphide, carbon dioxide which form biogas.

(4 × ½ Marks)

21. *Agave* propagates vegetatively by bulbils and *Bryophyllum* do it by adventitious buds. (2 marks)

22. (a) Reasons for causing infertility:

- Male: Abnormal sperm production or function, problems with the delivery of sperm due to premature ejaculation etc.
- Female: Ovulation disorder, uterine or cervical abnormalities, fallopian tube damage or blockage.

- (b) • Artificial Insemination (AI)

(i) It is a technique that can help the couple to have a child where the problem is with male partner.

(ii) In this technique, the semen collected either from the husband or a healthy donor is artificially introduced into the vagina or into the uterus of the female.

- ICSI (Intra cytoplasmic sperm injection)

(i) It is most often used with couples who are dealing with male infertility factors like low sperm counts, poor motility or movement of the sperm, poor sperm quality, sperm that lack the ability to penetrate an egg, or azoospermia.

(ii) It is used to enhance the fertilisation phase of *in vitro* fertilisation (IVF) by injecting a single sperm into a mature egg. (½ + ½ + 1 + 1 Marks)

23. The similarity between geitonogamy and xenogamy is that both types of pollinations are assisted by pollinating agencies, in transferring the pollens from anther of one flower, to the receptive stigma of another flower. The difference between the two is that in geitonogamy the pollen and stigma are genetically similar because they both belong to same plant but in xenogamy they are genetically different as they belong to different plants of same species. As cleistogamous flowers show homogamy remain closed causing self-pollinations and cleistogamy occurs late in the flowering season in some plants, e.g., *Commelina*, *Oxalis*, etc. (3 marks)

24. **Stirring type** : Cylindrical/curved at base and provided with stirrer to facilitate even mixing and oxygen availability throughout bioreactor. (3 marks)

25. (i) In band *D*, DNA fragments are smaller than those on band *C*. The fragments separate according to their size through the sieving effect provided by the gel. So, the smaller fragments move farther away than the larger ones.

(ii) *B* is anode.

(iii) Gel containing DNA fragments is stained with ethidium bromide compound followed by exposure to UV radiation. They are visible as range of colour bands. (1 + 1 + 1 Marks)

26. (i) The apical meristem of virus infected/diseased plant remains free of virus/pathogen. The shoot apex of such plant can be cultured.

(ii) The shoot tip is grown in a test tube under sterile conditions in special nutrients media. The nutrient medium should contain sugar, inorganic salts, vitamins, amino acids and growth regulators like auxins, cytokinins, etc. The tiny plantlets are later shifted to the field for further growth.

(iii) Micropropagation is the technology used for the production of large number of individuals *in vitro* in a limited space which can be employed for agriculture, horticulture and forestry. (1 + 1 + 1 Marks)

27. (a) State the cause and symptoms of Down's syndrome. Name and explain the event responsible for causing this syndrome.

(b) Haemophilia and Thalassemia are both examples of Mendelian disorder, but show difference in their inheritance pattern. Explain how. (½ + 1½ Marks)

28. (a) *Homo erectus*

(b) *Homo sapiens neanderthalensis*

(c) *Homo habilis*

(d) *Australopithecus africanus*

29. (i) The earth summit held at Rio de Janeiro in 1992 resulted into convention on Biodiversity.

(ii) An ex situ conservation method to preserve gametes for threatened species is cryopreservation.

**OR**

Wild life safari parks is related to ex-situ conservation of threatened animals and plants.

(iii) Four techniques are - Zoological parks, botanical gardens, cryopreservation, seed banks.

Seeds of different genetic strains of commercially important plants can be kept for long periods in seed banks. (1 + 1 + 2 Marks)

30. (i) Statins produced by the yeast *Monascus Purpureus* have been commercialised as blood-cholesterol lowering agents.

(ii) Bottled fruit juices bought from the market are clearer because they are clarified by the use of pectinases and Proteases.

**OR**

Aspergillus niger

(iii) (a) Statin

(b) Cholesterol lowering

(c) *Penicillium notatum*

(d) *Penicillin*

(e) *Trichoderma polysporum*