

PART - I (BIO-BOTANY)**SECTION - 1**

1. (b)
2. (c)
3. (a)
4. (d)
5. (d)
6. (d)
7. (c)
8. (c)

SECTION - 2

9. Mendelism was rediscovered independently in 1900 by three scientists:
 - (i) Hugo de Vries
 - (ii) Carl Correns
 - (iii) Erich von Tschermak
10. Phytoremediation is the process of using green plants to remove, degrade, or detoxify pollutants (such as heavy metals, pesticides, and other contaminants) from soil, water, or air.
11. The enzymes required for genetic engineering are:
 - (i) Restriction endonucleases
 - (ii) DNA ligase
 - (iii) DNA polymerase
 - (iv) Reverse transcriptase
12. Embryoids are embryo-like structures formed in vitro from somatic (non-reproductive) cells during plant tissue culture, without fertilization.
They have the ability to develop into a complete plant under suitable conditions.
13. The pyramid of energy is always upright because:
 - Energy flows in one direction from producers to consumers.
 - At each trophic level, a large amount of energy is lost as heat during respiration and metabolic activities (according to the second law of thermodynamics).
 - Only about 10% of energy is transferred to the next trophic level.
14. Microbial inoculants increase soil fertility by introducing beneficial microorganisms into the soil, which improve nutrient availability. They help in the following ways:
 - Nitrogen fixation: Bacteria like *Rhizobium*, *Azotobacter*, and *Azospirillum* convert atmospheric nitrogen into forms usable by plants.
 - Phosphate solubilization: Microbes such as *Pseudomonas* and *Bacillus* solubilize insoluble phosphates in soil.
 - Mycorrhizae (fungi): Enhance absorption of water and minerals, especially phosphorus.

SECTION - 3

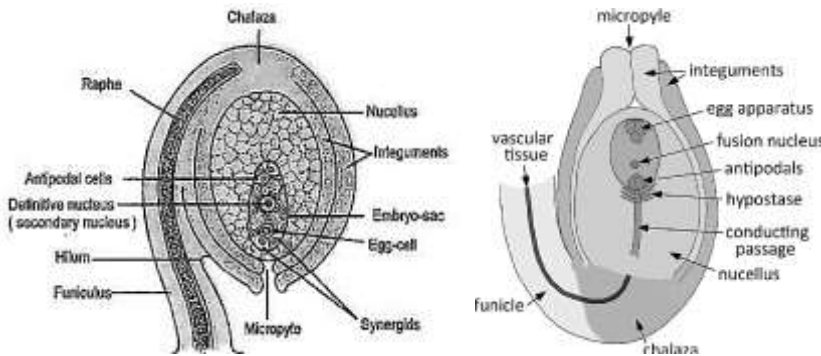
15. Genetic mapping is the process of determining the relative positions and distances of genes on a chromosome based on recombination frequency.
Uses of genetic mapping:
 - Helps in locating genes responsible for specific traits or diseases
 - Assists in plant and animal breeding programs
 - Useful in studying gene linkage and inheritance patterns
16. Cryopreservation is a technique of preserving living cells, tissues, or germplasm at very low temperatures (–196 °C in liquid nitrogen) to maintain their viability for long periods.
Uses: -
 - Long-term storage of seeds, pollen, embryos, and animal cells
 - Conservation of endangered species
 - Preservation of genetic resources for future useI prefer this response
17. Difference between Habitat and Niche
Habitat: The physical place or environment where an organism lives (e.g., forest, pond, desert).

Niche: The functional role of an organism in its habitat, including its mode of nutrition, interactions, and position in the ecosystem.

18. Forests help in maintaining climate in the following ways:

- They absorb carbon dioxide and release oxygen, reducing the greenhouse effect.
- Through transpiration, forests increase atmospheric moisture and help regulate rainfall.
- They moderate temperature by reducing extremes of heat and cold.

19.



Main parts to label:

- Funiculus – stalk attaching ovule to placenta
- Hilum – point of attachment
- Integuments – protective coverings
- Micropyle – opening for pollen tube entry
- Nucellus – nutritive tissue
- Embryo sac – female gametophyte
- Chalaza – region opposite the micropyle

SECTION - 4

20. (a) Single Cell Protein (SCP) refers to protein-rich biomass obtained from microorganisms such as algae, bacteria, fungi, and yeast, used as a supplementary protein source.

Applications:

- Used as food supplement for humans
- Used as animal and poultry feed
- Helps in waste utilization and reduces environmental pollution

OR

(b) Millets are small-seeded cereal crops grown as food grains, especially in dry regions, and are rich in fiber, minerals, and proteins.

Types of millets with examples:

- Major millets – Sorghum (Jowar), Pearl millet (Bajra)
- Minor millets – Finger millet (Ragi), Foxtail millet

21. (a) Inheritance of chloroplast genes is cytoplasmic (extranuclear) inheritance, usually transmitted through the female parent, because chloroplasts are present in the egg cytoplasm.

Example – *Mirabilis jalapa* (four-o'clock plant):

- Leaf colour (green, white, variegated) depends on the chloroplasts in the egg cell.
- Pollen does not contribute chloroplasts.
- Thus, offspring leaf colour is determined by the mother plant, not by Mendelian nuclear genes.

OR

(b) Microsporogenesis is the process by which microspores (pollen grains) are formed from microspore mother cells in the anther.

Steps involved:

- Formation of microspore mother cells (MMCs): Diploid MMCs are present in the pollen sacs of the anther.
- Meiosis: Each MMC undergoes meiotic division to produce a tetrad of four haploid microspores.
- Separation of microspores: The microspores separate from the tetrad and develop into pollen grains.

PART - II (BIO-ZOOLOGY)

SECTION – 1

22. (a)

- 23.(a)
24.(c)
25.(d)
26.(c)
27.(b)
28.(b)
29.(a)

SECTION - 2

30. Two main goals of the Human Genome Project (HGP) are:

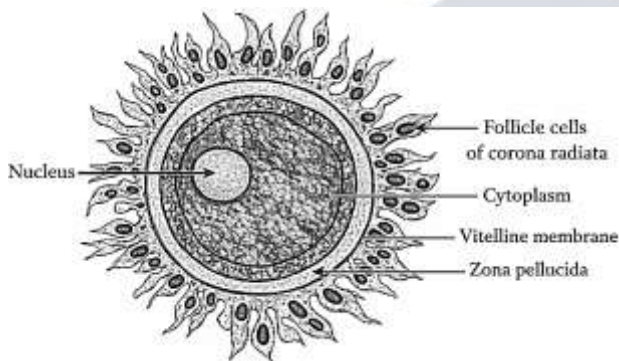
- To sequence the entire human DNA and identify all the genes in the human genome.
- To map the location of all genes on each chromosome for understanding their functions and interactions.

31. Oligopotency is the ability of a stem cell to differentiate into only a few closely related cell types.

Example:

- Lymphoid stem cells → can form B cells, T cells, or natural killer (NK) cells.

32. The human ovum is non-cleidoic, alecithal, and microscopic in nature. Its cytoplasm called ooplasm contains a large nucleus called the germinal vesicle. The ovum is surrounded by three coverings namely an inner thin transparent vitelline membrane, middle thick zona pellucida, and an outer thick coat of follicular cells called corona radiata. Between the vitelline membrane and zona pellucida is a narrow perivitelline space.



33. Industrial alcohol refers to ethanol (C_2H_5OH) produced for industrial purposes rather than for drinking.

Reason: -

- It is denatured (mixed with toxic substances) to make it unfit for human consumption.
- Used in solvents, pharmaceuticals, cosmetics, and fuel.

34. The term “Sameer” is generally used as a name, and it means:

- “Breeze” or “Gentle Wind” in Sanskrit and several Indian languages.
- It is a male given name commonly used in India and surrounding regions.

35. Risk factors for cervical cancer include:

- Human Papillomavirus (HPV) infection – especially types 16 and 18.
- Early sexual activity and multiple sexual partners.
- Weakened immune system (e.g., HIV infection).
- Smoking – exposure to tobacco carcinogens.
- Long-term use of oral contraceptives.
- Poor genital hygiene.
- Multiple pregnancies or high parity.

SECTION - 3

36. Coprolites are fossilized feces of ancient organisms.

Key points:

- Provide evidence of the diet and digestive habits of extinct animals.
- Help in studying ancient ecosystems and food chains.
- Usually preserved in sedimentary rocks.

37. Justification:

- Secretes human chorionic gonadotropin (hCG) – maintains corpus luteum in early pregnancy.
- Produces progesterone and estrogen – support uterine lining and fetal development.
- Secretes human placental lactogen (hPL) – regulates maternal metabolism for fetal growth.

38. E-waste (discarded electronic devices) causes toxic effects due to heavy metals like lead, mercury, and cadmium.

To reduce its harmful effects, the following solutions can be applied:

- Reduce and reuse electronics – Extend the life of gadgets to generate less waste.
- Proper recycling – Use certified e-waste recycling centers to safely extract metals and dispose of hazardous components.
- Safe disposal laws – Implement strict regulations for e-waste handling.
- Awareness and education – Encourage public and industries to adopt eco-friendly practices.
- Use of less toxic materials – Promote electronics made with safer, recyclable materials.

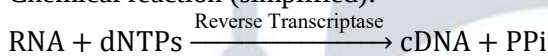
39. Here's a short and clear comparison between r-selected and K-selected species:

Feature	r-selected species	K-selected species
Reproductive rate	High (many offspring)	Low (few offspring)
Parental care	Little or none	Extensive care
Maturity	Rapid	Slow
Life span	Short	Long
Population stability	Unstable, fluctuates	Stable, near carrying capacity (K)
Example	Bacteria, insects, frogs	Elephants, humans, whales

40. Process:

- RNA → cDNA using reverse transcriptase.
- cDNA is then amplified by PCR.

Chemical reaction (simplified):



SECTION - 4

41. (a) We can promote biodiversity conservation by:

- Protecting natural habitats – forests, wetlands, coral reefs.
- Preventing overexploitation – avoid hunting, overfishing, and deforestation.
- Planting trees and restoring ecosystems.
- Supporting wildlife sanctuaries and protected areas.
- Raising awareness about the importance of biodiversity.

OR

(b) Hardy-Weinberg's assumptions on evolution state the conditions under which allele frequencies in a population remain constant (no evolution).

Assumptions:

- Large population size – prevents random genetic drift.
- Random mating – all individuals have equal chance to mate.
- No mutation – alleles do not change from one form to another.
- No migration – no immigration or emigration of individuals.
- No natural selection – all genotypes have equal survival and reproduction.

42. (a) Drugs can be classified based on their effects as:

- Stimulants – increase alertness and activity (e.g., *caffeine*, *nicotine*).
- Depressants – slow down nervous system activity (e.g., *alcohol*, *barbiturates*).
- Hallucinogens – alter perception and mood (e.g., *LSD*, *marijuana*).
- Narcotics/Analgesics – relieve pain and induce sleep (e.g., *morphine*, *heroin*).
- Cannabinoids – affect mood, memory, and appetite (e.g., *cannabis*).

OR

(b) Syngamy is the fusion of male and female gametes. It occurs in different ways in living organisms:

- Isogamy – Fusion of morphologically similar gametes (e.g., *Chlamydomonas*).
- Anisogamy – Fusion of morphologically different gametes; both are motile (e.g., *Volvox*).
- Oogamy – Fusion of a large non-motile egg and a small motile sperm (e.g., *human*, *plants*).

