

PART - I (BIO-BOTANY)

SECTION - 1

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

SECTION - 2

9. Mellitophily – Pollination by bees.

Flower features: bright colors, fragrance, nectar guides, landing platforms.

Example: Sunflower, Mustard.

10. Pollenkitt – A sticky, oily substance presents on the surface of pollen grains.

Functions: -

- Helps pollen grains stick to pollinators (insects, birds).

- Protects pollen from desiccation and UV radiation.

Found in: Mostly insect-pollinated (entomophilous) plants.

11. Significance of Ploidy:

(i) Genetic Variation: Different ploidy levels can create new traits useful in evolution and breeding.

(ii) Crop Improvement: Polyploidy can increase size, yield, and hardness of plants.

12. Examples of micropropagation in plants: -

Banana

Sugarcane

Potato

Orchids

13. Objectives of Plant Breeding:

- Increase yield of crops.

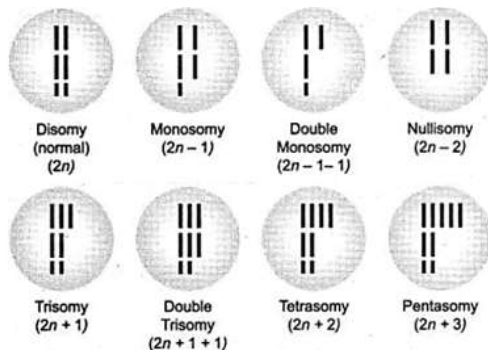
- Develop disease- and pest-resistant varieties.

14. (i) Biomedicines: Medically useful molecules obtained from plants that are marketed as drugs are called Biomedicines.

(ii) Botanical medicines: Parts of medicinal plants which are modified as powders or pills or other forms and marketed. These are called botanical medicines.

SECTION - 3

- 15.



16. Advantages of Artificial Seeds:

(i) Rapid propagation – Can produce large number of plants quickly.

(ii) Virus-free plants – Ensures healthy, disease-free plants.

(iii) Easy storage and transport – Can be stored and transported like normal seeds.

17. Examples of plants in commercial agroforestry:

(i) Teak (*Tectona grandis*)

- (ii) Eucalyptus
- (iii) Cashew (*Anacardium occidentale*)

18. Heterosis (Hybrid Vigour): -

Heterosis is the phenomenon where the hybrid offspring of two genetically different parents shows superior traits compared to both parents.

Key points:

- Traits improved: yield, growth rate, disease resistance, stress tolerance.
- Example: Hybrid maize varieties produce more grain than their parents.

19. Economic Importance of Rice: -

- (i) Food crop: Staple food for over half of the world's population.
- (ii) Employment: Provides livelihood to millions of farmers, especially in Asia.
- (iii) Industry: Used in rice milling, rice bran oil, beverages, and snacks.
- (iv) Export: Major source of foreign exchange for rice-growing countries.

SECTION - 4

20. (a) Dihybrid Cross: -

A dihybrid cross is a genetic cross between two individuals differing in two traits, each controlled by different genes. It is used to study the inheritance of two traits simultaneously.

Example:

- Cross between $RRYY \times rryy$ (R = round seeds, r = wrinkled; Y = yellow seeds, y = green).
- F₁ generation: all $RrYy$ (round yellow).
- F₂ generation shows a phenotypic ratio of 9:3:3:1 (Round Yellow: Round Green: Wrinkled Yellow: Wrinkled Green).

OR

(b) Advantages: -

- (i) Resistant to bollworm and other pests.
- (ii) Higher yield due to reduced crop loss.
- (iii) Reduced use of chemical pesticides.

Disadvantages: -

- (i) Expensive seeds for farmers.
- (ii) Risk of pest resistance over time.
- (iii) May affect non-target insects and biodiversity.

21. (a) Morphological adaptations of halophytes: -

- Succulent leaves/stems – store water (e.g., *Salicornia*).
- Reduced leaf size – minimizes transpiration.
- Thick cuticle – prevents water loss.
- Salt glands – excrete excess salt (e.g., *Aeluropus*).
- Deep or extensive roots – absorb water from saline soil.

OR

(b) (i) Food Web: -

A food web is a network of interconnected food chains in an ecosystem, showing how different organisms obtain energy by eating one another.

(ii) Significance of Food Web: -

- (1) Shows flow of energy and matter in an ecosystem.
- (2) Maintains ecological balance by linking producers, consumers, and decomposers.
- (3) Explains the interdependence of species.

PART-II (BIO-ZOOLOGY)

SECTION - 1

22.(b)

23. (c)

24. (a)

25.(a)

26.(a)

27.(c)

28. (a)

29.(c)

SECTION - 2

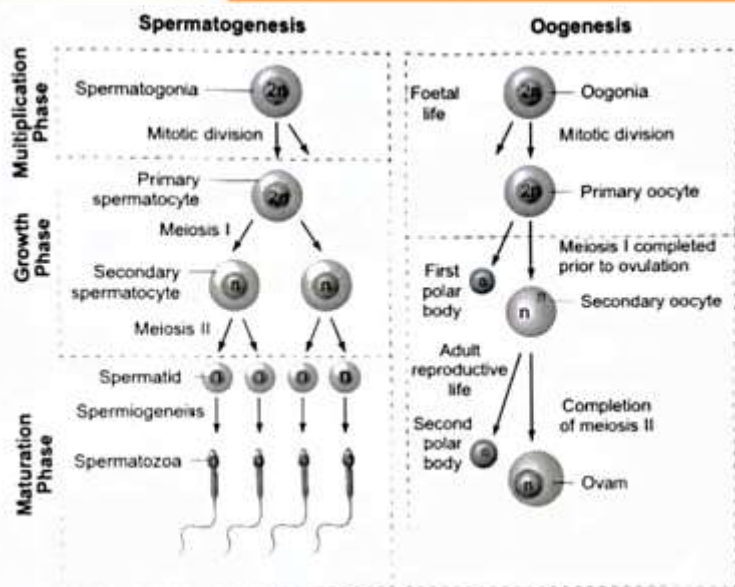
30. Mass extinction is the sudden, widespread, and rapid decrease in the number of species on Earth, affecting a large proportion of plants and animals across different habitats.
31. Parthenogenesis: -
 - Complete: No fertilization; only females produced.
 - Incomplete: No fertilization; produces males and females (e.g., honeybee).
32. Expansions: -
 ZIFT – Zygote Intra-Fallopian Transfer
 ICSI – Intracytoplasmic Sperm Injection
33. Two salient features of the Human Genome Project (HGP):
 (i) Sequencing of entire human DNA – determined the complete sequence of ~3 billion base pairs.
 (ii) Identification of all human genes – estimated 20,000–25,000 genes in the human genome.
34. Homologous organs are organs that have similar structural features and common evolutionary origin but may perform different functions.
 Example: -
 Forelimb of human (arm), wing of bat, flipper of whale, foreleg of horse.
35. Pre-proinsulin is the precursor molecule of insulin synthesized in the β -cells of the pancreas.
 It contains:
 (i) Signal peptide – directs it to the endoplasmic reticulum.
 (ii) B chain, C peptide, A chain – forms the insulin molecule after processing.

SECTION - 3

36. Inhibin: -
 - Definition: Inhibin is a hormone secreted by the gonads (ovaries in females, testes in males) that inhibits the secretion of FSH (Follicle Stimulating Hormone) from the anterior pituitary.
 Functions:
 (i) Regulates FSH secretion – prevents overstimulation of gamete production.
 (ii) Maintains normal reproductive function – ensures proper development of ovarian follicles or spermatogenesis.
37. Phenylketonuria (PKU) – Symptoms: -
 (i) Mental retardation / developmental delay
 (ii) Musty or mousy odor in urine, skin, or breath
 (iii) Eczema or skin rashes
 (iv) Seizures
 (v) Fair skin, light hair, and blue eyes (due to lack of melanin)
38. Three main objections to Darwinism: -
 (i) Gaps in fossil record – Missing transitional forms challenged gradual evolution.
 (ii) Origin of new traits – Darwin could not explain how completely new organs or complex structures arise.
 (iii) Heredity mechanism – The role of genetics and inheritance was unknown in Darwin's time.
39. Three adaptations in terrestrial animals: -
 (i) Limbs for locomotion – Strong legs for running, walking, or jumping (e.g., horse, frog).
 (ii) Respiration – Lungs adapted for breathing air (e.g., lizard, bird).
 (iii) Water conservation – Kidneys and skin reduce water loss (e.g., camel).
40. The ELISA (Enzyme-Linked Immunosorbent Assay) is a highly sensitive test that can detect antigens in the nanogram range.
 Advantages of ELISA: -
 (i) High sensitivity and specificity – can detect very small amounts of antigen.
 (ii) Quantitative measurement – gives amount of antigen present.
 (iii) Rapid and reliable – suitable for large-scale screening.
 (iv) Versatile – can detect antigens or antibodies in various samples (blood, urine, saliva).

SECTION - 4

41. (a)



OR

(b) Difference between Active and Passive Immunity: -

Feature	Active Immunity	Passive Immunity
Definition	Immunity developed when body produces its own antibodies	Immunity gained by receiving ready-made antibodies
Onset	Slow (days to weeks)	Immediate
Duration	Long-lasting (months to years)	Short-lived (weeks to months)
Example	Vaccination, infection recovery	Maternal antibodies, antiserum injection

42. (a) Technique to solve paternity dispute: DNA Fingerprinting

Principle: -

- Based on unique DNA sequences in every individual (except identical twins).
- Short Tandem Repeats (STRs) or Variable Number Tandem Repeats (VNTRs) are compared between child, mother, and alleged father.
- Inheritance: Half of the child's DNA comes from the mother and half from the biological father.
- Matching the STR/VNTR patterns confirms biological relationship.

OR

(b) Waste generated at home : paper, cloth, plastic, cans, carton boxes, wood, sewage, kitchen waste etc.

Waste generated at school : paper, chalk, plastic, envelopes etc.

Waste generated during trips : paper, disposable cups, plates, spoons, plastic envelopes, discarded food etc.

Yes, waste can easily be reduced by us through judicious use of materials, by changing our habits and life styles. The waste belongs to two categories: Biodegradable and non-biodegradable. It is difficult or rather impossible to degrade non-biodegradable waste because microorganisms cannot decompose these.