SET 1 – FULL ANSWER KEY

Section – A (1×16)

1. C
2. C
3. C
4. B
5. C
6. C
7. B
8. C
9. C
10. C
11. B
12. B

13. A
14. A
15. A
16. A

Section – B (2 Marks Each)

17A. Emasculation and Bagging

Emasculation is removal of anthers before they release pollen to prevent self-pollination.
Bagging involves covering emasculated flower with butter paper bag to prevent unwanted pollen entry.

OR

Cleistogamous flowers remain closed and hence only self-pollination occurs, ensuring autogamy.

18. Lac Operon Regulation

In absence of lactose → Repressor binds operator → Transcription stops.
In presence of lactose → Allolactose binds repressor → Repressor inactivated → RNA polymerase transcribes genes.

19. Active vs Passive Immunity

Active Immunity	Passive Immunity
Body produces antibodies	Ready-made antibodies given
Long lasting	Temporary
Memory cells formed	No memory cells

20A. Restriction Enzymes

Called molecular scissors because they cut DNA at specific palindromic sequences.

OR

Insertional inactivation → Insertion of foreign gene in antibiotic resistance gene disables it, helping identify recombinants.

21A. Pyramid of Biomass

Terrestrial → Upright (Producers > Herbivores > Carnivores)
Aquatic → Inverted (Phytoplankton less biomass, high turnover)

Section – C (3 Marks Each)

22. Fertilisation to Implantation

1. Ovulation → Ovum released
2. Fertilisation in ampullary region
3. Zygote → Cleavage → Morula → Blastocyst
4. Implantation in endometrium

23. Dihybrid Cross

TtRr × TtRr

Phenotypic ratio → **9:3:3:1**

24. Convergent Evolution

Unrelated species develop similar structures due to similar environment.
Example: Wings of bat and butterfly.

25. PCR Steps

1. Denaturation (94°C)
2. Annealing (50–65°C)
3. Extension (72°C)
   Taq polymerase used.

26. Sewage Treatment

Primary → Physical removal
Secondary → Aerobic microbes reduce BOD

27. ELISA

Enzyme Linked Immuno Sorbent Assay.
Principle: Antigen-antibody interaction.
Used for HIV detection.

28. Logistic Growth

$dN/dt = rN (K−N/K)$
K = Carrying capacity

Section – D (4 Marks Each)

29. Low Sperm Count Case

A. Oligospermia
B. IVF / ICSI
C. Fertilisation outside body
D. Ethical issue → Surrogacy / embryo selection

30. Immunity Case

A. Colostrum → Passive
Vaccine → Active
B. Vaccine stimulates memory cells
C. Passive declines as antibodies degrade
D. Memory cells provide long-term protection

Section – E (5 Marks Each)

31. Transcription (Prokaryotes)

1. Initiation – RNA polymerase binds promoter
2. Elongation – RNA synthesis
3. Termination – Rho dependent/independent

Eukaryotes → mRNA undergoes capping, tailing, splicing.

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32. Agrobacterium Role

Ti plasmid transfers gene to plant cell.
Enzymes: Restriction enzyme, Ligase, Polymerase.
Bt cotton → Cry toxin forms pores in insect gut.

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33. Ecology Justification

A. Competitive exclusion → One species eliminated
B. Resource partitioning → Niche differentiation
C. Competitive release → Expansion after competitor removal
D. 10% Law → Only 10% energy transferred
E. First law → Energy conserved, not created