SET 7 – FULL ANSWER KEY

Section – A Answers (1×16 = 16 Marks)

1. **B** – Egg and male gamete
2. **B** – Progesterone
3. **B** – 5' → 3'
4. **C** – Allolactose
5. **B** – Heritable
6. **C** – AUG
7. **A** – 0.4
    - Recessive phenotype = 16%
    - $q^2 = 0.16$
    - $q = 0.4$
8. **A** – Retrovirus
9. **C** – Sporulation
10. **C** – Producers
11. **D** – Rapid reproduction
12. **B** – Circular extrachromosomal DNA
13. **A**
14. **A**
15. **A**
16. **A**

Section – B Answers (2×5 = 10 Marks)

17A. Double Fertilisation

• One male gamete + egg → Zygote (2n)
• Second male gamete + two polar nuclei → Endosperm (3n)

Products:
• Embryo
• Endosperm

Unique feature of angiosperms

OR

Oral contraceptive pills:

Contain estrogen and progesterone

Prevent pregnancy by:
• Inhibiting ovulation
• Thickening cervical mucus
• Preventing implantation

18. Structure of tRNA

• Clover leaf structure
• Anticodon loop
• Amino acid acceptor arm
• D loop
• TΨC loop

Function: Transfers specific amino acid during translation

19. Gene Frequency

Gene frequency = Proportion of an allele in gene pool

Natural selection increases frequency of advantageous allele and decreases harmful allele.

20A. Cloning Vector

Features:
• ori
• Selectable marker
• Restriction site
• Small size

OR

PCR:

- Denaturation
- Annealing
- Extension

Taq polymerase works at high temperature.

21A. Energy Pyramid

Producers = 200,000 kcal

Primary = 20,000 kcal
Secondary = 2,000 kcal
Tertiary = 200 kcal

OR

Logistic Growth:

$dN/dt = rN (K - N)/K$

S-shaped curve

Section – C Answers (3×7 = 21 Marks)

22. Menstrual Cycle

- Menstrual phase
- Follicular phase (FSH)
- Ovulation (LH surge)
- Luteal phase (Progesterone)

If fertilisation does not occur → Hormone levels drop → Menstruation

23. Dihybrid Cross (RrYy × RrYy)

Phenotypic ratio = **9:3:3:1**

Wrinkled green = rryy

Probability = 1/16

Genotypic ratio = 1:2:1:2:4:2:1:2:1

24. Lamarck vs Darwin

Lamarck	Darwin
Use & disuse	Natural selection
Acquired traits inherited	Only heritable variation
Example: Giraffe neck	Survival of fittest

25. Transcription

- Initiation (RNA polymerase binds promoter)
- Elongation
- Termination

mRNA synthesized in 5' → 3' direction

26. Sewage Treatment

Primary: Removal of large particles

Secondary: Aerobic microbes reduce BOD

27. Innate vs Acquired Immunity

Innate: Non-specific, immediate

Acquired: Specific, memory cells

28. Population Growth Numerical

Formula:
$Nt = N_0 e^{(rt)}$

$N_0 = 500$
$r = 0.2$
$t = 3$

Nt = 500 e^(0.6)

e^0.6 ≈ 1.82

Nt ≈ 910 individuals

Section – D Answers (4×2 = 8 Marks)

29. ABO Case

Father = IAi
Mother = IBi

Possible groups: A, B, AB, O

Probability of O = 1/4

Inheritance = Codominance + Multiple alleles

AB universal recipient → No antibodies

30. Bt Cotton

Gene = cry1Ac

Organism = Bacillus thuringiensis

Cry toxin forms pores in insect gut

Refuge strategy prevents resistance development

Section – E Answers (5×3 = 15 Marks)

31. DNA Replication

- Semi-conservative
- Helicase
- Primase
- DNA polymerase
- Ligase

Replication is semi-conservative because each daughter DNA has one parental strand.

32. Agrobacterium & RNAi

Ti plasmid transfers gene

Restriction enzymes cut at palindromic sites

RNAi degrades mRNA

33. Ecology

- Competitive exclusion → Gause experiment
- Resource partitioning → Warblers
- Keystone species → Pisaster
- 10% law → Lindeman
- Tropics higher biodiversity → Stable climate