



Attempt questions first; check the separate key afterward. Use labelled diagrams where asked. Give scientific reasons; answer key covers closed questions.

A. Very short answers - 1 mark each

1. During which interphase stage is DNA replicated?
2. Name the resting/non-dividing phase entered by some cells.
3. At which mitotic stage do chromosomes align at the equator?
4. At which mitotic stage do sister chromatids separate?
5. Which meiotic division is reductional?
6. In which prophase-I stage does synapsis occur?
7. In which stage does crossing over occur?
8. In which stage are chiasmata clearly visible as homologues separate?

B. Short answers / practice - 2 marks each

9. Compare G_1 , S and G_2 phases.
10. Why is interphase metabolically active rather than simply resting?
11. Describe chromosome condensation during prophase.
12. Explain spindle attachment and kinetochore function.
13. Compare chromosome behaviour in metaphase and anaphase.
14. Distinguish karyokinesis and cytokinesis.
15. Compare cytokinesis in plant and animal cells.
16. Explain the significance of mitosis in growth and repair.
17. Why does meiosis maintain chromosome number across sexual generations?
18. Describe all five stages of prophase I.
19. Distinguish bivalent, tetrad and chiasma.
20. Compare anaphase I and anaphase II.

C. Application / reasoning - 3 marks each

21. A cell has $2n=16$. How many bivalents form in prophase I?
22. For $2n=16$, how many chromosomes occur in each normal gamete?
23. A G_1 nucleus has 2C DNA. State DNA amount after S phase.
24. Does S phase normally double chromosome number counted by centromeres?
25. A $2n=10$ cell reaches mitotic metaphase. Find chromosome and chromatid counts.
26. How many cells result from one complete meiotic division sequence?
27. A diploid meiocyte has 12 chromosomes. Count chromatids at metaphase I.
28. Explain how crossing over and independent assortment create variation.
29. Why is no S phase needed between meiosis I and II?
30. How many mitotic rounds produce 32 cells from one, without losses?
31. Distinguish chromosome count from DNA content across cell division.

D. Extended practice - 5 marks each

32. Draw mitotic stages for a cell with $2n=4$ and explain chromosome movement.
33. Compare mitosis and meiosis in divisions, products, ploidy and significance.
34. Trace chromosome number and DNA content through meiosis of a $2n=6$ cell.
35. Explain prophase-I events with labelled diagrams, highlighting recombination.

ANSWER KEY - Numerical / closed questions

- 1) S phase. 2) G_0 . 3) Metaphase. 4) Anaphase. 5) Meiosis I. 6) Zygotene. 7) Pachytene. 8) Diplotene. 21) Eight. 22) Eight. 23) 4C. 24) No. 25) 10 chromosomes; 20 chromatids. 26) Four, typically. 27) 24. 30) Five.