1. During which phase of meiosis do homologous chromosomes separate?
   A. Prophase I B. Metaphase I C. Anaphase I D. Anaphase II
2. Which event during prophase I increases genetic variation?
   A. Chromosome duplication B. Crossing over C. Spindle formation D. Cytokinesis
3. A human gamete contains how many chromosomes?
   A. 23 B. 46 C. 92 D. 21
4. What is the result of crossing over?
   A. Identical chromatids B. Extra chromosomes C. Genetic recombination D. DNA replication
5. Which structure forms during cytokinesis in plant cells?
   A. Cleavage furrow B. Centriole C. Cell plate D. Spindle fibre
6. At what stage of meiosis are tetrads visible?
   A. Prophase II B. Metaphase I C. Anaphase I D. Telophase I
7. What best describes independent assortment?
   A. Random fusion of gametes B. Random alignment of homologous pairs in metaphase I
   C. Separation of sister chromatids D. Formation of spindle fibres
8. What is the primary function of meiosis?
   A. Growth B. DNA repair C. Production of haploid gametes D. Tissue regeneration
9. Which of the following distinguishes meiosis from mitosis?
   A. Two rounds of cell division B. Identical daughter cells C. One DNA replication step
   D. All of the above
10. Which structure connects sister chromatids?
    A. Centrosome B. Kinetochore C. Centromere D. Microtubule

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True or False (T/F):

11. Crossing over occurs during metaphase I.
12. Meiosis produces four genetically identical haploid cells.
13. Anaphase II separates homologous chromosomes.
14. The cell cycle includes meiosis as a phase.

15. A zygote is formed by the fusion of two gametes.

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16. Explain how crossing over contributes to genetic variation.
17. Compare and contrast metaphase I and metaphase II.
18. Describe how nondisjunction can lead to aneuploidy.
19. Why are gametes haploid while somatic cells are diploid?
20. Identify the key events of prophase I.
21. What is synapsis and why is it important in meiosis?
22. Describe two major differences between cytokinesis in animal vs. plant cells.
23. What role do spindle fibres play in meiosis?
24. Why doesn't DNA replication occur between meiosis I and meiosis II?
25. Define the term "chiasma" and explain its significance.

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26. A mutation affects proteins involved in synapsis. Predict how meiosis would be impacted.
27. Two gametes combine but one carries an extra chromosome. What is the likely genetic condition?
28. Explain how meiosis followed by fertilization restores the diploid number in humans.
29. How does sexual reproduction contribute to population-level genetic variation?
30. A student observes a cell with 46 chromosomes in prophase I. How many chromatids are present?
31. Predict the outcome if spindle fibres fail to form in metaphase I.
32. Describe how meiotic errors can lead to heritable genetic disorders.
33. Compare the end result of meiosis in males and females.
34. A parent has a trisomy condition. In which meiotic phase did the error likely occur?
35. Explain how meiosis can create new gene combinations not found in either parent.

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36. Compare and contrast the processes and outcomes of mitosis and meiosis.
37. Explain how the stages of meiosis ensure both reduction division and genetic diversity.
38. Describe the process of spermatogenesis versus oogenesis.
39. Discuss how chromosomal abnormalities during meiosis can affect phenotypes.
40. Evaluate the role of meiosis in evolution and natural selection.
41. Explain how prenatal genetic screening can detect meiotic errors.
42. How does nondisjunction during meiosis I differ from nondisjunction during meiosis II?
43. Discuss one ethical dilemma associated with screening embryos for chromosomal disorders.
44. Describe one laboratory technique that allows observation of meiosis.
45. Design an experiment to observe meiotic stages using prepared slides and staining.