

Cell Cycle and Meiosis Concept Questions

1. Propose a reason for the importance of the high level of regulation of the cell cycle.
2. You overhear some students talking about cell division before class one day. One student claims all cells in your body divide at the same rate. Respond to the student.
3. Looking under a microscope, you notice that some cells have several nuclei within the cytoplasm of a single cell. Identify the phase of the cell cycle that is most likely not operating correctly to result in such cells.
4. Propose a reason cytokinesis must occur after, rather than before, mitosis.
5. Identify the difference between cytokinesis in animal cells and plant cells.
6. A particular drug interferes with the construction of the mitotic spindle. Predict the effect on cells exposed to this drug.
7. Propose a reason that DNA replication must occur during interphase of cell division.
8. a) A new drug is developed that forces cells to remain in G1 of the cell cycle. A culture of dividing cells is exposed to the drug. Predict the effect on the cells.
b) In a different experiment, the drug is administered to live mice. Predict the effect on individual mice.
9. Identify the signals that control the growth and division of normal cells.
10. Some cells are engineered to ignore the checkpoints. The cells are then placed in a medium that contains all the required nutrients for growth. Predict the results.
11. Explain how mutagens can cause cancer.
12. Cancer cells are unusual in a variety of ways: they are immortal, they metastasize, they don't perform their normal function, and they can form tumors. Explain each of these characteristics at the cellular level.
13. a) Describe some evidence that suggests that cells are able to count the number of times they've divided.
b) Explain how a better understanding of how cells count the number of times they've divided might help extend human life span.
14. Describe a way stem cells can be used to address the problems of organ transplantation.
15. Distinguish between haploid and diploid cells in humans. Apply them to the terms 'somatic cell' and 'sex cell.'
16. State whether homologous chromosomes have the same number of genes. State whether they have identical genes. Explain your responses.
17. a) A cell with 10 chromosomes undergoes mitosis. Indicate the number of chromosomes you would expect in each of the daughter cells.
b) Indicate the number of chromosomes you would expect in each of the daughter cells after meiosis.
18. Explain how traits possessed by parents (such as hair color) can be inherited by their offspring.
19. a) Each parent donates one copy of each chromosome to an offspring. Whereas the daughter cells of meiosis I are already haploid, explain why meiosis II is necessary.
b) Explain why there is no DNA replication before meiosis II.
20. A chicken has 78 chromosomes in its somatic cells.
a) State the number of chromosomes it inherited from each parent.
b) Predict the number of chromosomes you would find in each somatic cell of the chicken's offspring.
c) Predict the number of chromosomes you would find in each of the chicken's gametes.
d) Predict the number of chromosomes you would find in a fertilized chicken egg.
21. a) If a cell has a diploid number of 32, predict the number of chromosomes you would find in a cell in late Prophase I of meiosis.
b) Predict the number of chromosomes you would find in a cell in Telophase II.
22. Describe some differences and similarities between meiosis and mitosis.

23. Explain how the production of gametes and sexual reproduction increase genetic variation.
24. Describe how synapsis can lead to the exchange of genetic material between chromosomes.
25. Meiosis can produce different combinations of alleles. Identify the original source of variation among the different alleles of a gene.
26. A horticulturalist is breeding orchids to try to obtain a plant with a unique combination of desirable traits. After many years, she finally succeeds. To produce more plants like this one, state whether she should breed it with another plant or clone it. Justify your response.
27. Explain why the offspring of an asexually reproducing eukaryotic organism are genetically identical to each other and to the parents.
28. Describe what a karyotype is and its purpose. Identify the source of cells for making a karyotype.
29. Describe nondisjunction and its effect on the chromosomal composition of a cell.
30. As any pair of chromatids can fail to separate during meiosis, theoretically there are 23 possible kinds of monosomy and trisomy. Propose a reason for the rare (or nonexistent) cases of monosomy or trisomy for most of the 23 chromosome pairs.