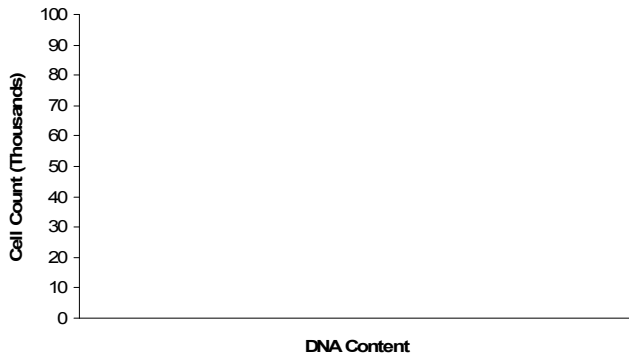


1. Describe the three different cell cycle checkpoints, how they work and what is being “checked”.

2. For a population of cells with a diploid number of 4, draw a graph indicating the analysis of 300 thousand cells using a flow cytometer; include on one graph a subpopulation of cells that had nondisjunction and a failed M-phase checkpoint but continued to divide regardless. Also draw a graph of a normal population of these cells (I suggest you do this first).



3. Draw and label all three structures that connect mammalian cells. Describe their function.

4. Propose an experiment to test the hypothesis that similar cells express cadherins that are unique to that cell type.

5. Describe the differences and similarities between G-protein and tyrosine kinase mediated cell signals.

6. Draw and label the structure of a sperm and egg (human).

7. List and describe the steps of fertilization of sea urchin gametes. Describe how polyspermy is avoided.

8. Match the following terms to the descriptions listed to the right. Terms may be used once, more than once, or not at all. Please list all correct answers.

- | | | |
|-----------------|-------|---|
| A. Ectoderm | _____ | A zygote is this. |
| B. Endoderm | _____ | Cells move during this. |
| C. Gastrulation | _____ | Gut forms from this. |
| D. Mesoderm | _____ | If a two-cell embryo is split and results in identical twins, then each of the cells must have been this. |
| E. Pluripotent | _____ | Somites form from this. |
| F. Somite | _____ | The notochord and neural tube can induce cells of this structure. |
| G. Totipotent | _____ | This is a germ layer. |
| | _____ | This process occurs after the formation of a blastula. |
| | _____ | This remains on the surface of a gastrula. |
| | _____ | Vertebrae form from this. |

9. Explain what is occurring during gastrulation.