# Assignment Summary

For this essay, you will respond to a long free-response question (FRQ) similar to those asked on the AP Biology examination.

Free-Response Question

A scientist studies the effects of growth factors on cell division. She sets up several experiments with mammalian cultured HeLa cells and epidermal growth factor, EGF. In the first experiment, she finds that when the cells in limited media are grown with the addition of EGF, they divide and proliferate at normal rates, and those grown without EGF divide at much slower rates. She repeats the experiment with normal cells and cancer cells. She arranges a third experiment to compare HeLa cells treated with different concentrations of EGF and the resulting cell division and growth. See her results in the charts below.

**Model 1. Epidermal Growth Factor Pathway**

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**Table 1. Experiment 2 Results**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Cell Type | EGF Treatment (ug) | Time: 0Cells in M Phase | Time: 0Total Cells | Time: 24hCells in M Phase | Time: 24hTotal Cells |
| HeLa | 0 | 7 | 50 | 2 | 57 |
| HeLa | 10 | 8 | 50 | 29 | 90 |
| Cancerous | 0 | 22 | 50 | 4 | 60 |
| Cancerous | 10 | 27 | 50  | 286 | 465 |

**Table 2. Experiment 3 Results**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Cell Type | EGF Treatment (ug) | Time: 0Cells in M Phase | Time: 0Total Cells | Time: 24hCells in M Phase | Time: 24hTotal Cells |
| HeLa | 0 | 11 | 75 | 8 | 73 |
| HeLa | 0.5 | 15 | 75 | 23 | 104 |
| HeLa | 5 | 18 | 75 | 45 | 160 |
| HeLa | 10 | 9 | 75 | 68 | 188 |
| HeLa | 25 | 13 | 75 | 105 | 235 |

1. **Describe** how EGF affects cell division.
2. **Identify** the role of each experiment in determining the difference in how cancer and normal cells respond to EGF.
3. **Calculate** the mitotic index (number of cells in mitosis divided by total cells) for each kind of cell. Compare the mitotic rates for each cell type
4. **Predict** the cause of rapid growth in the cancer cells observed in experiment 2. Justify your answer with evidence and reasoning.