**NANSI 2013 – Cell Biology and Development Team** *version 1*

**Topic:** Cell Division

**Learning Outcome:** be able to evaluate/predict the consequences of mutations in the components of Ras cascade on the pathway and signaling output/cell proliferation.

**Activity:** Students work as groups to complete the following chart

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Receptor Tyrosine Kinase** | **Ras** | **ERK** | **Cell Proliferation** |
| Wild type cells without growth factor | Off | GDP-bound | Inactive,  Not phosphorylated | No proliferation |
| Wild type cells with growth factor | On | GTP-bound | Active,  Phosphorylated | Proliferation |
| Mutations that keep Ras in the GTP-bound form |  |  |  |  |
| Mutations that keep Ras in the GDP-bound form |  |  |  |  |
| Mutations that inactivate GAP |  |  |  |  |
| Mutations that overexpress RTK |  |  |  |  |

**NANSI 2013 – Cell Biology and Development Team** *version 2a*

**Topic:** Cell Division

**Learning Outcome:** be able to evaluate/predict the consequences of mutations in the components of Ras cascade on the pathway and signaling output/cell proliferation.

**Activity:** Students work as groups to complete the following chart. Each group has a different mutation.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Receptor Tyrosine Kinase** | **Ras** | **ERK** | **Cell Proliferation** |
| Wild type cells without growth factor | Off | GDP-bound | Inactive,  Not phosphorylated | No proliferation |
| Wild type cells with growth factor | On | GTP-bound | Active,  Phosphorylated | Proliferation |
| Mutations that keep Ras in the GTP-bound form |  |  |  |  |

**NANSI 2013 – Cell Biology and Development Team** *version 2b*

**Topic:** Cell Division

**Learning Outcome:** be able to evaluate/predict the consequences of mutations in the components of Ras cascade on the pathway and signaling output/cell proliferation.

**Activity:** Students work as groups to complete the following chart. Each group has a different mutation.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Receptor Tyrosine Kinase** | **Ras** | **ERK** | **Cell Proliferation** |
| Wild type cells without growth factor | Off | GDP-bound | Inactive,  Not phosphorylated | No proliferation |
| Wild type cells with growth factor | On | GTP-bound | Active,  Phosphorylated | Proliferation |
| Mutations that keep Ras in the GDP-bound form |  |  |  |  |

**NANSI 2013 – Cell Biology and Development Team** *version 2c*

**Topic:** Cell Division

**Learning Outcome:** be able to evaluate/predict the consequences of mutations in the components of Ras cascade on the pathway and signaling output/cell proliferation.

**Activity:** Students work as groups to complete the following chart. Each group has a different mutation.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Receptor Tyrosine Kinase** | **Ras** | **ERK** | **Cell Proliferation** |
| Wild type cells without growth factor | Off | GDP-bound | Inactive,  Not phosphorylated | No proliferation |
| Wild type cells with growth factor | On | GTP-bound | Active,  Phosphorylated | Proliferation |
| Mutations that inactivate GAP |  |  |  |  |

**NANSI 2013 – Cell Biology and Development Team** *version 2d*

**Topic:** Cell Division

**Learning Outcome:** be able to evaluate/predict the consequences of mutations in the components of Ras cascade on the pathway and signaling output/cell proliferation.

**Activity:** Students work as groups to complete the following chart. Each group has a different mutation.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Receptor Tyrosine Kinase** | **Ras** | **ERK** | **Cell Proliferation** |
| Wild type cells without growth factor | Off | GDP-bound | Inactive,  Not phosphorylated | No proliferation |
| Wild type cells with growth factor | On | GTP-bound | Active,  Phosphorylated | Proliferation |
| Mutations that overexpress RTK |  |  |  |  |