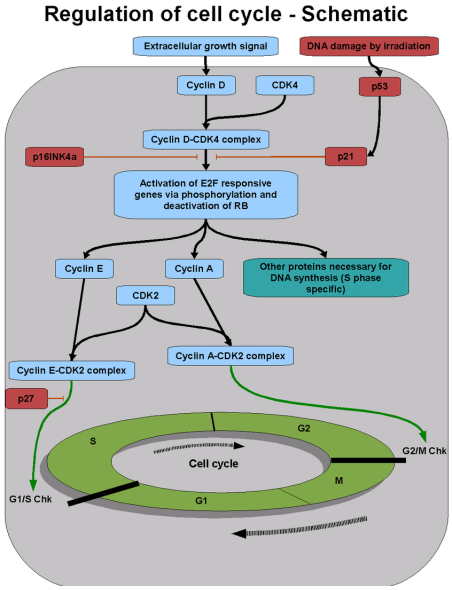
CONCEPT: G_1 PHASE AND S PHASE ENTRY

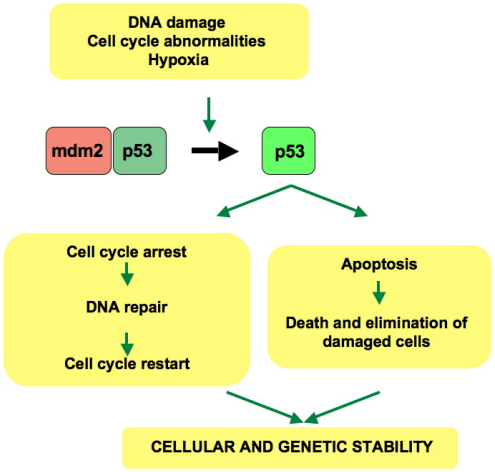
- G_1 phase is a _____ phase that occurs after interphase but before DNA replication and cell division
  - □ The G_1 to S phase transition is critical – because once it enters S phase the cell has to divide or die
    - Initiated by **START**
  - □ **Mitogens** are extracellular signals that the cell receives during interphase to signal for growth and division
    - Stimulate G_1 phase cylins and cyclin-dependent kinases
    - Also inhibits S and M phase cyclins to prevent a rapid re-division before the cell is ready

EXAMPLE: Mitogens stimulating the cell cycle



  - □ If the DNA is _____ the cell will halt in G_1
    - **p53** is a transcription regulator that halts entrance into S phase if the DNA is damaged
    - p53 is mutated in a large amount of cancers
  - □ If the cell is determined to not be ready for division it can enter into $\mathbf{G_o}$ which is a non-dividing state
    - The cell can remain here for prolonged periods of time
    - Terminally differentiates cells (like nerve cells) can stay in G_o for forever

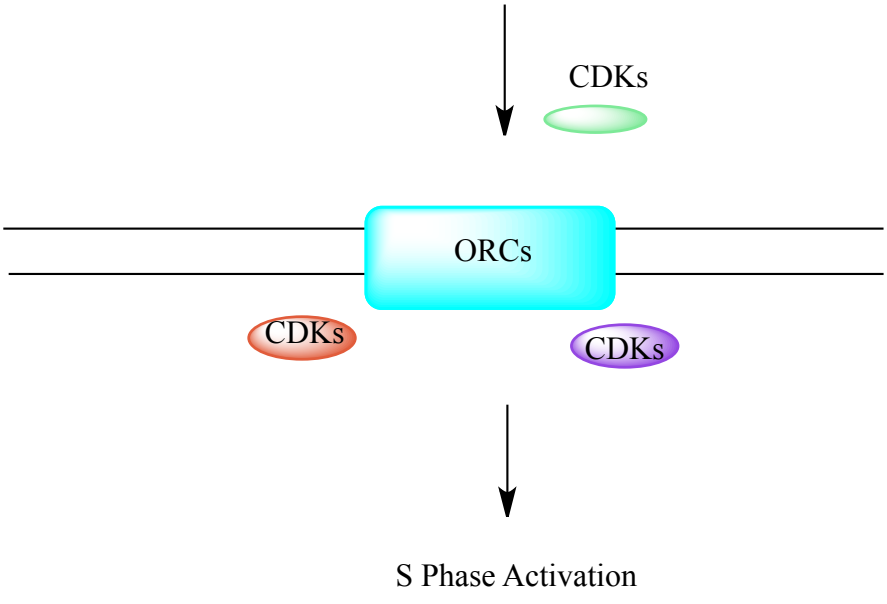
EXAMPLE: p53 and the Cell Cycle



S Phase Entry

- **S-Cdks** are the main driving proteins responsible for the cell _____ S phase
  - □ **S-Cdk** triggers S phase by:
    - Activating DNA helicases
    - Promoting replication fork formation
  - □ The **pre-replicative complex** is recruiting to *origins of replication* by S-Cdk
    - **Concentration gradients**: Concentrations of molecules differ on either side of a membrane

EXAMPLE: S-Cdks activation S phase



PRACTICE:

1. What protein halts entry into S phase when DNA is damaged?
    a. Mitogen
    b. p53
    c. S-Cdk
    d. M-Cdk

2. Which of the following is NOT a function of S-Cdks?
    a. Causing the entrance of the cell into S phase
    b. Recruiting DNA helicases
    c. Activating mitogens
    d. Promoting the formation of the replication fork