

Unit 4/5:

Cellular Communication
& Cell Cycle

Cellular Communication

Reception

Ligand (signaling molecule) binds to receptor
Causes conformational shape change
Ex: G protein coupled receptor

Steroid Hormone

Release: Simple Diffusion
Receptor: Intracellular
Example: Testosterone, Estrogen

Protein Hormone

Release: Exocytosis
Receptor: Extracellular
Example: Insulin

Transduction

Signaling cascades relay signals from receptors to cell targets, often amplifying the incoming signals

Phosphorylation Cascade

Protein Kinase
Phosphorylate relay molecules

Secondary Messengers

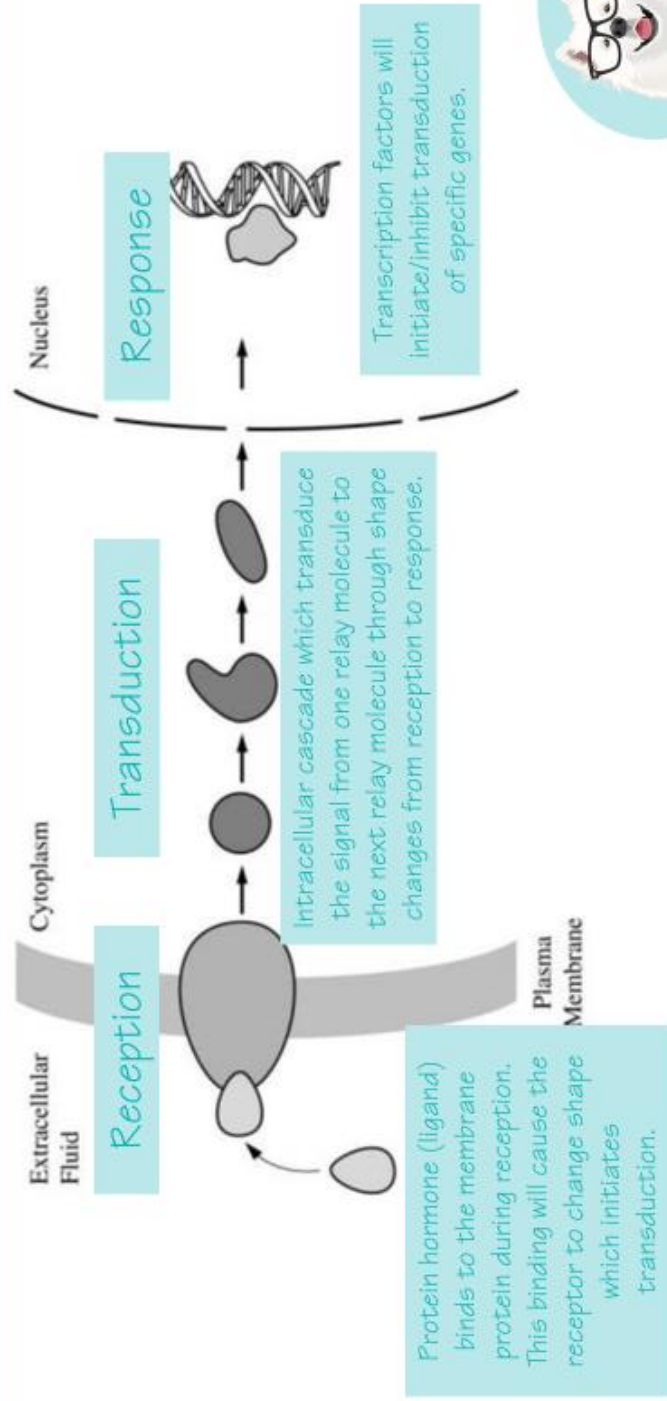
Ca²⁺
cAMP

Response

cell growth
secretion of molecules
gene expression
apoptosis



Cellular Communication



	Parent Cell	Rounds of DNA Replication	Rounds of Nuclear Division	Daughter Cell Ploidy	Number of Daughter Cells
Mitosis	Diploid	1	1	Diploid	2
Meiosis	Diploid	1	2	Haploid	4

Mitosis vs. Meiosis

	Compare to Parent Cell	Crossing Over	Independent Assortment
Mitosis	Identical	Does not occur	Does not occur
Meiosis	Genetically Distinct	Occurs in Prophase I	Occurs in Metaphase I



G₁

The cell grows through all the different phases of interphase
Duplication of cell organelles
Synthesis of proteins, RNA, and building blocks

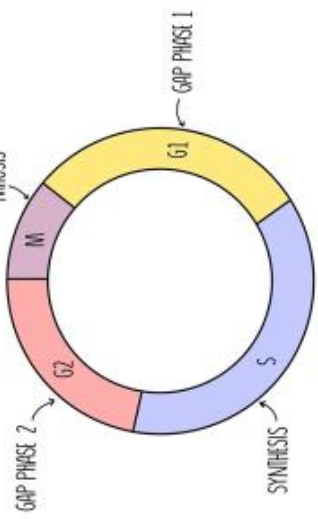
S

Replication of genetic material and centrosomes
Makes organelles and reorganizes cellular contents

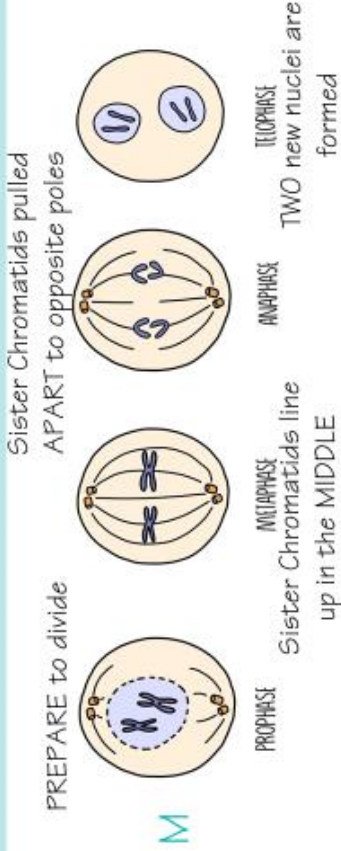
G₂

Synthesis of proteins and RNA

Makes organelles and reorganizes cellular contents

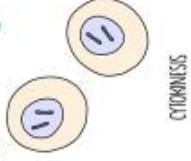


Cell Cycle



Division of the cytoplasm

Cytokinesis



CYTOKINESIS

M

PROPHASE

METAPHASE

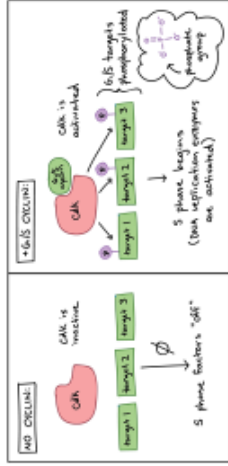
ANAPHASE

TELOPHASE

M

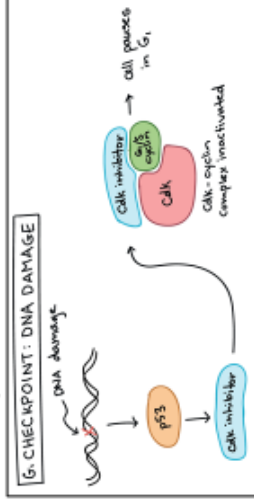
G₁

During G₁, determines whether to complete the cell cycle to
• Growth factor
• Adequate reserves
• Check for DNA damage
If do not pass, enter G₀ (nondividing state)



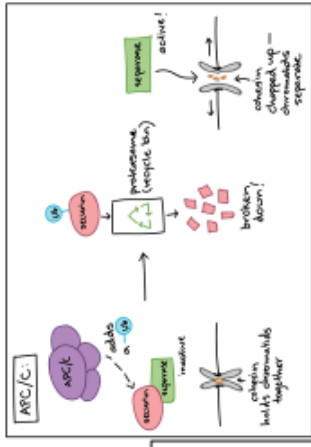
G₂

Check all DNA replicated and not damaged.
If detect problems with DNA, the cell cycle is halted, to complete DNA replication or repair the damaged DNA.



M

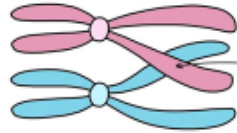
Check sister chromatids attached to the spindle microtubules



Checkpoints

Prophase I

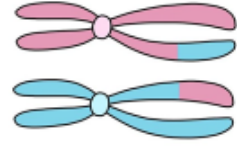
Chromatin condenses
Sister chromatids/ homologous chromosomes align



CHROMATID
HOMOLOGOUS CHROMOSOMES HAVE A DIFFERENT COMBINATION OF ALLELES

Metaphase I

HOMOLOGOUS CHROMOSOMES align on the metaphase plate
INDEPENDENT ASSORTMENT



Anaphase I

HOMOLOGOUS CHROMOSOMES separate to opposite poles

Telophase I

Nuclear envelope forms around the HAPLOID daughter cells

Meiosis

Meiosis I – Homologous Chromosomes
Meiosis II – Sister Chromatids

Chromatin condenses
Sister chromatids align

SISTER CHROMATIDS align on the metaphase plate
SISTER CHROMATIDS separate to opposite poles

Nuclear envelope forms around the HAPLOID daughter cells

Prophase II

Metaphase II

Anaphase II

Telophase I