Phases of the cell cycle Mitosis

Prophase	Chromosomes condense and spindle aparatus forms
Promet-aphase	Kinetochores assembled at centromere, 2 opposite sides connected to microtubles
Metaphase	Lined up on imaginary metaphase plate. Polar microt-ubles extend from each spindle, overlap in middle, pole-pole connection
Anaphase	Cohesions are cleaved, daughters to opposite sides of cell. poles pulled apart
Telophase	Nuclear envelope reforms, chromosomes begin to condence
Cytoki-nesis	Division of cytoplasm

Mitosis

Mitosis	When cells divide, two gentetically identical sister cells are their products
Uses	Somatic cells

G1 checkpoint

1.	Cells big enough
2.	Sufficient nutrients
3.	social signals present
4.	Cells undamaged

G2 checkpoint

1.	No errors in replication
2.	Activated MPF (cyclin + CDK) present
3.	Undamaged

Metaphase checkpoint

1.	Chromosomes attatch to spindles
2.	Chromosomes properly segregated
3.	MPF absent

Mechanisms of cell cycle progression

Nucleotide excision repair	1. Error detected in DNA by proteins
	2. DNA nicking (cut at both sides of damage)
	3. Helicase unwinds and removes region with damaged bases
	4. DNA polymerase fills gap with undamadged strand as template
	5. Nuleotide linkage (DNA ligase links the strand into esisting strand.
	If sucessful continues past G1 checkpoint
P53 gene	Creates CDK inhibitors if the cell is damaged so if cyclin is still present, CDK can still say no if damaged
UVRA	recgonizes DNA damage, signals to start repair, if damage cant be repaired cell wont divide anymore.
recA	Facilitates DNA repair

DNA synthesis in Leading strand

Synthesized	Continously
Begins with	RNA primer
After RNA primer	DNA polymerase

DNA synthesis in lagging strand

Synthesized	in fragments (Okazaki fragments)
Initiated by	RNA polymerase
RNA polymerase	builds primers
DNA polymerase	replicates DNA off of primers
RNA primer	popped out of gaps and replaced with DNA polymerase

Both leading and Lagging strands	
Single stranded binding proteins (SSBs)	Keep stands from attatching back together
Ligase	Fills in gaps or breaks in phosphodi-ester bonds of backbone
Helicase	Seperares, unwinds double stranded DNA
Topoisomerase	Helps with stress on wound DNA, ex. Gyrase

Importance of Telomeres	
Protect from	important DNA being cut out
Everytime cell divides	become shorter
Replication limit	prevents cancer
Why?	There is no 3' hydroxyl at end of lagging stand.
What?	G-rich series of repeats
Telomerase	elongates parental in 3' to 5' direction.