The Control of the Cell Cycle & Cancer

- Cell cycle is normally tightly controlled so cells on divide when need to. Checkpoints at the start of each stage of the cell cycle involve a variety of factors including control genes – decide whether a cell can continue to next stage of cell.
- If the control genes mutate due to carcinogenic agents (viruses ionising radiation, chemicals or other environment triggers) then the mutated control genes won't control the checkpoints properly – thus cells divide uncontrollably, leading to cancer.
- Oncogenes: encode proteins that stimulate the cell cycle by allowing cells to pass the checkpoints. Normally the oncogenes are only expressed when needed, but if they mutate then the proteins can be made all the time and the cell cycle continues unchecked.
- Tumour-suppressor genes: Encode proteins that stop the cell cycles by blocking the checkpoints. Mutations in these genes can stop the correct proteins being formed, so the cell cycle continues unchecked.
- Telomerase genes: Encode the enzyme telomerase that extends the telomeres (or tails) on the ends of each chromosome. Normally this gene is inactive and the telomeres get shorter with every cell cycle. After about 30 cycles the telomeres are so short that the DNA cannot be replicated and this sets a limit on the number of cell cycles a cell can do. A mutation that activates the telomerase genes causes the telomeres to be replaced after each division, so there is no limit to how many time a cell can divide.
- Anti-cancer drugs block the cell cycle.
- A tumour is a mass of identical cells (clones) formed by uncontrolled cell division
- A benign tumour grows slowly, remains encased in a capsule and does not spread far; they're usually harmless (warts) though can cause harm if pressing on blood vessels or tissues – otherwise treated with surgery or radiation.
- Malignant tumour grows quickly and spreads throughout the surrounding tissue affecting normal functions and causing harm such as lung cancer, which reduces elasticity of alveoli. These are more difficult to treat without damaging the whole tissue.
- Metastasis is a tumour that has spread to the bloodstream or lymphatic system and so can spread to other parts of the body (secondary tumours); these are the most difficult to treat.

<u>Prokaryotic Cell Division</u>

- Takes place using binary fission:
- 1) Replication of Chromosome.