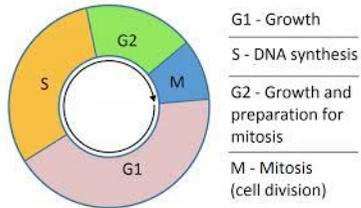


## Highsted Knowledge Organiser Biology Year 9: Cell Division

### What I need to know

Cell division-mitosis;  
Growth and differentiation;  
Stems cells and stem cell dilemmas.  
Calculate the percentage of time a cell is in each stage of the cell cycle.  
Evaluate the use of stem cells in research.

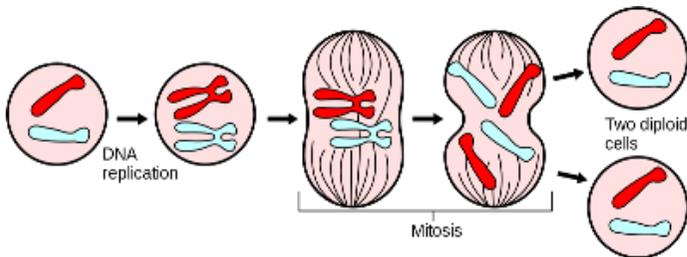


G1 - Growth  
S - DNA synthesis  
G2 - Growth and preparation for mitosis  
M - Mitosis (cell division)

### Mitosis and the cell cycle

**Stage 1:** DNA replicates and forms two copies of each chromosome and increase the number of cell organelles.

**Stage 2:** Mitosis: one set of chromosomes are pulled to each end of the cell and the nucleus divides.  
**Stage 3:** the cytoplasm and the cell membranes divide to form two genetically identical cells.



### Key Vocabulary:

**Chromosome:** made of DNA and contains genes that code for certain characteristics.  
**Nucleus:** membrane bound structure that contains DNA  
**Gamete:** a sex cell e.g. sperm or egg.  
**Genes:** short sections of DNA that code for a characteristic.  
**Allele:** a different version of a gene. E.g. the allele for blue eye or green eyes  
**Zygote:** a single new cell made after a sperm and egg fuse.

**Allele:** a different version of a gene. E.g. the allele for blue eye or green eyes.

**Cell cycle:** the series of stages the cells goes through in cell division.

**Mitosis:** cell division that produces two genetically identical cells.

**Differentiate:** where a cell become specialised to perform a particular function

**Stem Cell:** an unspecialised cell that can differentiate into any type of cell.

**Cloning:** producing genetically identical offspring.

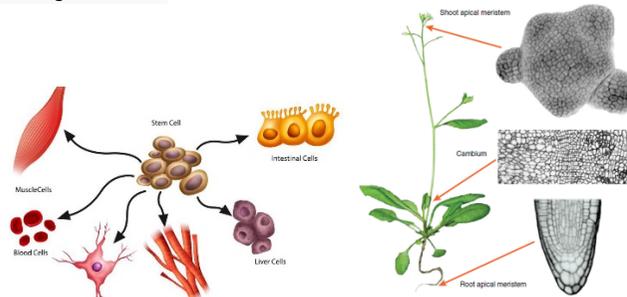
### Stem Cells

**Embryonic stem cells** are undifferentiated cells, they have the potential to turn into any kind of cell.

**Adult stem cells** are found in the bone marrow, they can only turn into some types of cells e.g. blood cells.

### Uses of stem cells:

- Replacing faulty blood cells;
- making insulin producing cells;
- making nerve cells.

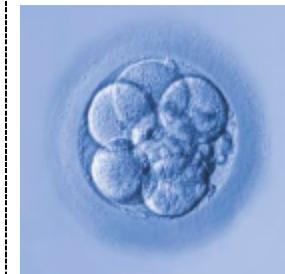


### Stem Cells in Plant

In plants, stem cells are found in the meristem. These stem cells are able to produce clones of the plant. They can be used to grow crops with specific features for a farmer, e.g. disease resistant.

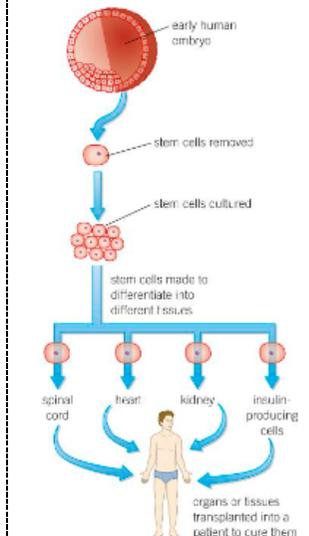
### Stem cell dilemmas

- Embryonic stem cells (ESCs) can be collected & cloned for potential medical uses.
- This raises ethical & religious issues however, as some believe it interferes with human reproduction & the embryo cannot give consent.
- Adult stem cells on the other hand might be infected with viruses, as well as triggering an immune response if the donor & patient are unrelated. DNA replication & production of new cell organelles e.g. ribosomes & mitochondria



### Therapeutic cloning

- An embryo is produced with the same genes as the patient. Stem cells from the cloned embryo are not rejected by the patient & so could be used for medical treatment.



### Challenge question:

Why are plant stem cells useful to agriculture? Why might stem cells not be as successful as once hoped?

### Suggested reading

<https://www.bhf.org.uk/informationsupport/heart-matters-magazine/research/breakthroughs-in-stem-cell-research>

<https://www.bbc.co.uk/news/topics/cvenzmggr8t>

<https://hsci.harvard.edu/diabetes-0>