

# Stem Cells: GCSE Biology

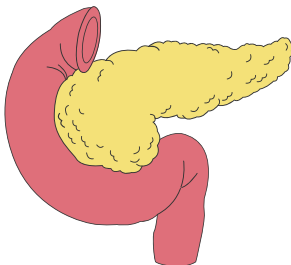
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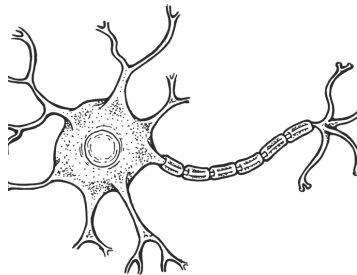
## 1. Introduction

- Cells with the ability to divide repeatedly to produce more similar cells that also differentiate are called **stem cells**.
- These are **unspecialized**, that is, they do not have a specific function.
- They give rise to cells that **specialize** in different functions.
- For example, stem cells develop into pancreatic cells and help in digesting sugar.
- Another example, cells in the lungs are designed to exchange gases.

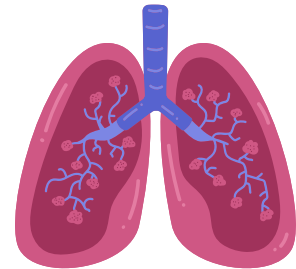
### Real-life examples



Pancreatic cells digest sugar



Nerve cells in brain transmit signals



Lung cells exchange gases

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### 2. Where are Stem Cells Found?

- Stem cells are found in both plants and animals.
- **In plants**, stem cells are present in **meristems**.
- It includes the regions of **apical meristem** (root and shoot), **lateral meristem** (sides of stem and root), and **intercalary meristem** (base of leaves and internodes).
- **In animals**, these cells are found in early-stage embryo and are called **embryonic stem cells**.
- Apart from this, these can be observed in most adult tissues, known as **adult stem cells**.

### 3. What are the functions of Stem Cells?

- The major functions of stem cells are - **Differentiation, tissue growth, and repair**.
- Stem Cells **differentiate** into specialized cells in both plants and animals.
- After growth, they are found as adult stem cells that, in humans, allow **tissue growth**.
- Cells that get old or are damaged need replacement. Stem cells replace these cells to **repair the tissue**.

### 4. Advantages of Using Stem Cells in Medicine

- **Diseases** caused by **damaged cells** can be **treated** using **stem cells**.
- Treatment of diseases such as **type I diabetes**. E.g., Bone marrow transplantation to cure a blood disease.
- Study of stem cells can help appropriate **drug development** for humans.
- With this, there is **no need to test drugs on humans**, as can be done in lab settings.
- For example, testing on transparent young zebrafish.

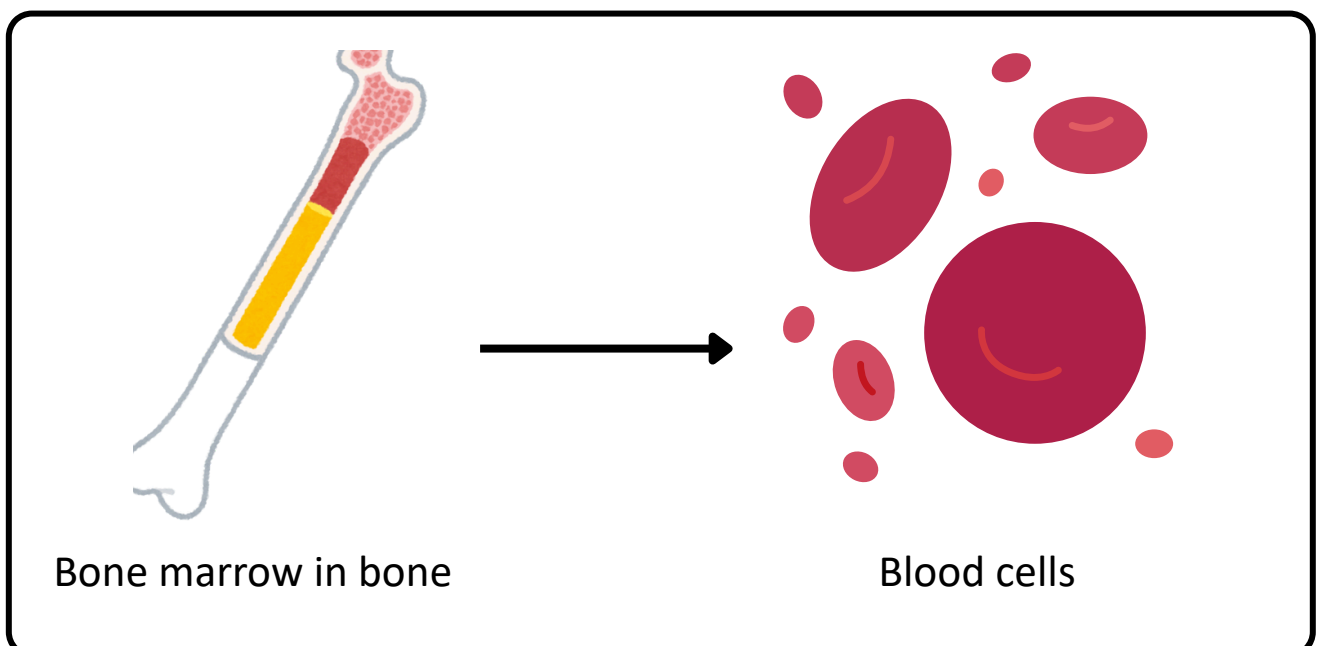
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### 5. Risk of Using Stem Cells In Medicine

- Continued division after replacement of damaged cells can lead to **cancer**.
- Using stem cells to treat a disease involves putting them in the body of the patient. The immune system of the body usually kills these cells.
- The reason the immune system kills these cells is that they are treated as foreign particles.
- It is known as **rejection**.

### 6. Function of Stem Cells in Bone Marrow

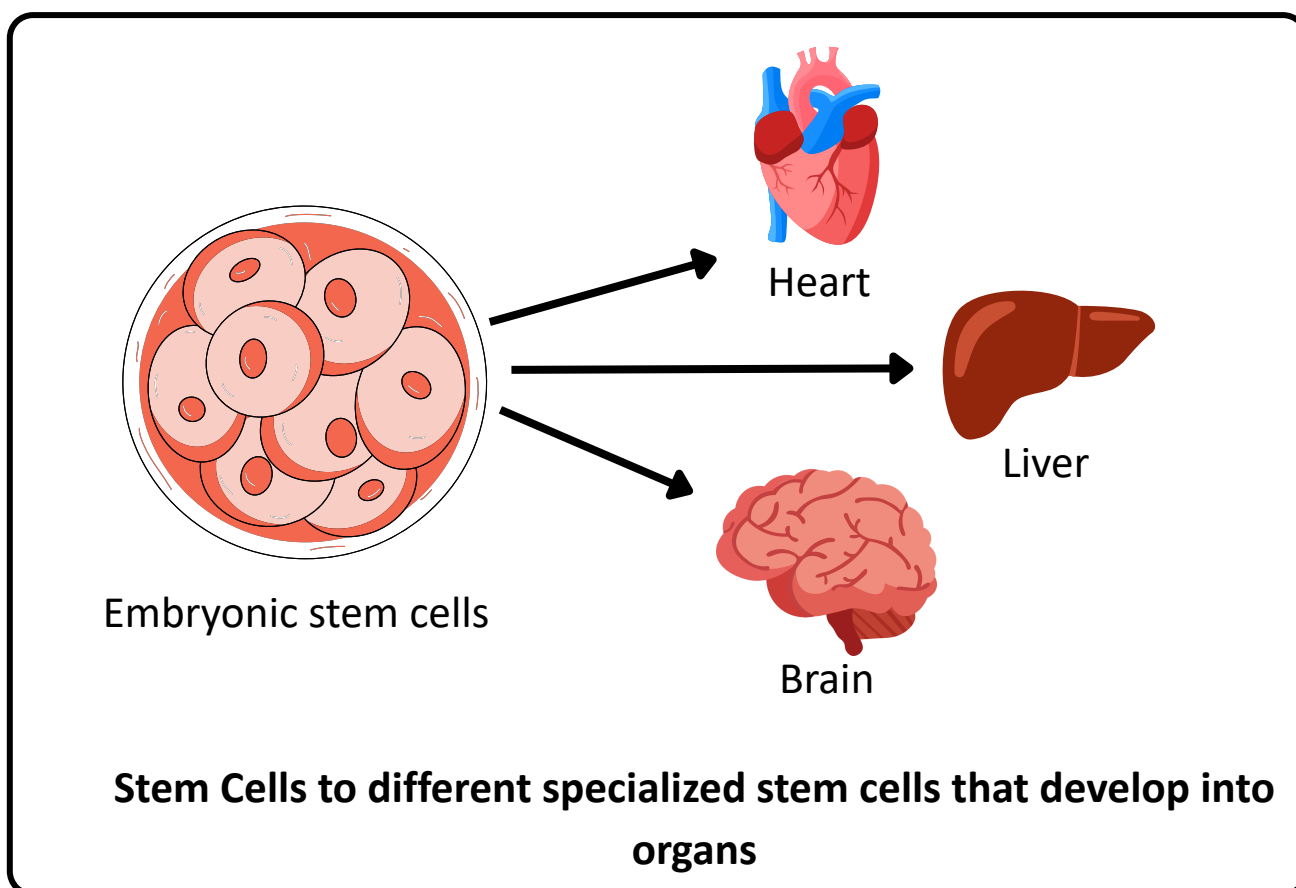
- Stem cells are present in the **middle** of those **bones** in the body that are **long**, like the femur.
- During their whole life, they **divide continuously** and **produce new blood cells**.
- Stem cells can only give birth to those specialized cells that are in the tissue surrounding them.
- Since blood stem cells are found in bone marrow and blood cells surround them, they produce blood cells only.



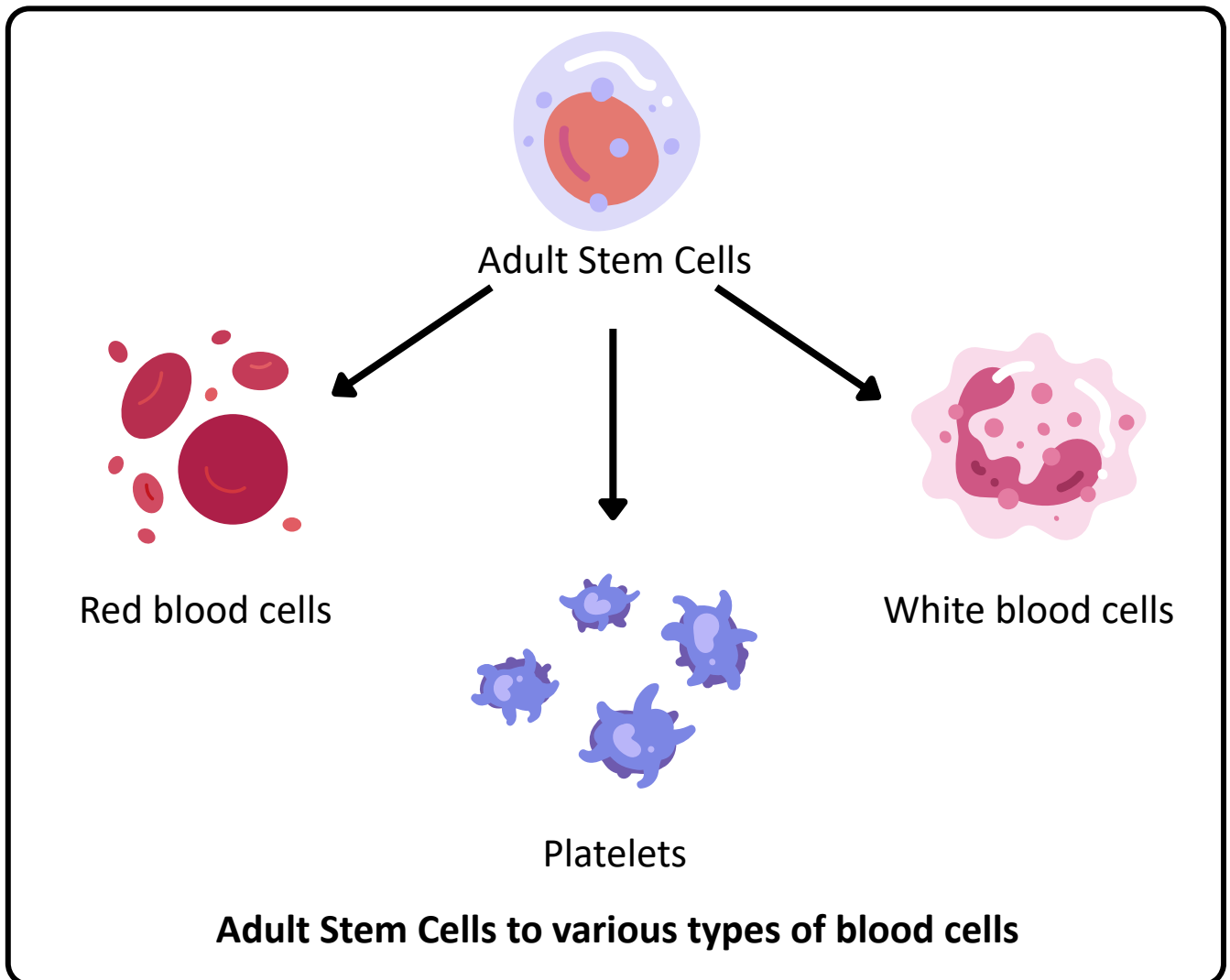
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### 7. Comparison of Adult Stem Cells with Embryonic Stem Cells

Comparison on the basis of -	Embryonic Stem Cells	Adult Stem Cells
<b>Types of specialized cell they produce</b>	Any type of specialized cell	Type of cells is in the tissue around them
<b>Their functions</b>	Development to make organs	Tissue growth and replacement of old or damaged cells



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### 8. Roles of Meristems in Plant Growth

- In plants, the **roots** and **shoots** are the areas where **growth** happens.
- **Meristems** are **stem cells** found in these regions.
- The cells in meristems divide continuously by **mitosis**.
- These take part in **elongation** as the length of the cells increases.
- Refer to [7.Plant Meristem Elongation](#) in Cell Differentiation & Specialization.

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## FAQs :

### 1. What are stem cells?

Stem cells are undifferentiated cells that undergo division to make more similar cells and differentiate into specialized ones.

### 2. What are the types of stem cells in animals?

In animals, there are two types of stem cells. These include embryonic stem cells and adult stem cells.

### 3. What are stem cells used for in medicine?

Stem cells are used for the treatment of diseases, replacement of damaged cells, and drug research.

### 4. What are the risks of using stem cells in medicine?

Usage of stem cells in medicine involves the risk of cancer and rejection by immune system.

### 5. What is the function of adult stem cells?

Adult stem cells are responsible for tissue growth and cell repair.