

# Stem Cells Lesson Plan

## Resources Provided

- "Introducing Stem Cells" video can be viewed using the following link: <https://youtu.be/X4zcOFRLnzs>
- Stem Cells PowerPoint Presentation
- Stem Cells Lesson Plan
- STEMinator cards for printing

## Keywords and Definitions

	Keyword	Definition
1.	<b>Cell</b>	The smallest part of an animal or plant that is able to function independently. Every animal or plant is made up of trillions of cells.
2.	<b>Stem Cell</b>	A type of cell that can copy themselves (self-renew) and make other types of cells (differentiate).
3.	<b>Self-renewal</b>	Process of creating more cells of the same cell type through cell division.
4.	<b>Cell Division</b>	The splitting of a cell into two new cells with the same genetic material.
5.	<b>Differentiate</b>	Process of cells obtaining more specialised features to perform specific functions.

6.	<b>Regeneration</b>	Regrowth by an animal or plant of an organ, tissue, or part that has been lost or damaged.
7.	<b>Gene</b>	A section of DNA that controls what a cell does.
8.	<b>Limb</b>	Your limbs are your arms and legs.

## Extra Info / Files

	Web Address	Brief Description
1.	<a href="http://www.youtube.com/watch?v=evH0I7Coc54">www.youtube.com/watch?v=evH0I7Coc54</a>	Video on stem cells
2.	<a href="http://www.eurostemcell.org">www.eurostemcell.org</a>	Stem cell resources
3.	<a href="http://www.crm.ed.ac.uk/stem-cells-regenerative-medicine/what-are-stem-cells">www.crm.ed.ac.uk/stem-cells-regenerative-medicine/what-are-stem-cells</a>	Website with helpful background information for teachers

## Materials Needed

- Printer
- Paper (**Note:** The cards are easier to work with if printed out on thicker paper)
- Scissors
- A partner to play the game with

## STEMinator Card Game Instructions

- Print out the STEMinator cards using the double-sided paper setting on your printer. **Note:** If you do not have this setting you can glue the back of the cards onto the face of the cards using Pritt Stick, or just have the back of the cards remain blank.
- Cut out the 24 cards with scissors cutting along the black dashed lines.
- Play the game in "Top Trumps" style.
- The dealer shuffles and deals an equal number of cards to each person face down.
- The player who did not deal starts by reading out the value from a category from the top card (Self-renewal, Differentiation, Relative Size, or Relative Number).
- The player with the highest value wins and collects the cards, including his/her own, and places them on the bottom of his/her pile.
- The winner of the hand gets to go next and chooses a category from the card on top of his/her deck.
- If the two cards share the highest value, then both the cards are placed in the middle and the same player chooses again from the next card. The winner of the hand takes the cards in the middle as well.
- Continue playing until a player has all the cards.
- The player with all the cards at the end is the winner.
- As you play notice how the higher differentiated a cell is, the lower its self-renewing power will be.
- Also, notice how the lower differentiated a cell is, the higher its self-renewing power will be.

- Read about the different types of cells on the cards and what they do in your body.
- Feel free to create your own games using the cards. "Snap" style is a popular version!

### Categories:

**Self-renewal** = The ability of the cell to proliferate or self-renew.

**Relative Size** = The size of the cell compared to other cells in the body.

**Differentiation** = How specialised or differentiated the cell is (or the degree of specialisation).

**Relative Number** = The number of cells in the body compared to other cell types.

### Cells on the Cards:

Lineage Group	Cell Name	Characteristics
Cartilage	<b>Transitory Chondrocyte</b>	This type of cell gives rise to more a mature chondrocyte, called an articular chondrocyte.
Cartilage	<b>Articular Chondrocyte</b>	Cells that maintain and produce the components that make up cartilage.
Cartilage	<b>Cartilage</b>	A rubber-like tissue made of collagen and elastin that covers and protects the ends of bones at joints.

Tendon	<b>Mesenchymal Stem Cell</b>	A type of stem cell that is able to differentiate into a wide variety of cell types.
Tendon	<b>Tenoblast</b>	A spindle-shaped, immature tendon cell that gives rise to a tenocyte.
Tendon	<b>Tenocyte</b>	A mature tendon cell that attaches to collagen fibres in a tendon.
Blood Cell	<b>Hematopoietic Stem Cell</b>	A stem cell located in bone marrow that gives rise to blood cells.
Blood Cell	<b>Megakaryocyte</b>	A large cell found in the bone marrow that produces thrombocytes.
Blood Cell	<b>Thrombocyte (Platelet)</b>	A cell found in the blood involved in clotting to stop bleeding.
Skin	<b>Epidermal Stem Cell</b>	A cell that is responsible for everyday regeneration of the different layers of the epidermis in the skin.
Skin	<b>Keratinocyte (Young)</b>	This cell type is located in the inner layer of the skin's epidermis.
Skin	<b>Keratinocyte (Old)</b>	This type of cell forms a protective barrier in the outer layer of the skin's epidermis.
Muscle	<b>Myoblast</b>	These cells combine and develop into myoblast tubes to form muscles.

Muscle	<b>Myoblast (Tube)</b>	These cells are formed when myoblasts stick together and form a tube structure.
Muscle	<b>Muscle</b>	This tissue responsible for movement throughout the body from walking to pumping blood.
Myelin Sheath	<b>Neural Stem Cell</b>	A type of cell located in the brain that can generate <u>both</u> neurons and glial cells.
Myelin Sheath	<b>Glial Progenitor Cell</b>	This cell type gives rise to oligodendrocytes.
Myelin Sheath	<b>Oligodendrocyte</b>	A type of cell that insulates neurons which allows the nervous system to react quicker.
Neuron	<b>Neuronal Stem Cell</b>	A cell that makes <u>only</u> neurons in the developing brain.
Neuron	<b>Neurocyte</b>	A cell that can develop into neurons in the brain.
Neuron	<b>Neuron</b>	A cell that receives and transmits information in the brain.
Bone	<b>Transitory Osteoblast</b>	This cell moves into developing and growing bones.
Bone	<b>Osteoblast</b>	This cell produces proteins and minerals to form bone.

Bone	<b>Osteocyte</b>	An osteoblast that has become trapped in a mature bone.
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