Differentiate!
The Stem Cell Card Game

For 2 to 4 Players
In this game, you are scientists who are studying stem cells. To win, be the first to grow three new kinds of cells in your lab!

MAKE THE CARDS

• **Print** the cards on one side of heavy paper or light card stock. Then print the pattern on the other side. This will help keep the faces of the cards from showing through.

• **Cut** the cards to make your deck.

• **Shuffle** the deck of cards well (at least seven times!).

SET UP THE GAME

1. **Place Lab Sheets**
   Each player places a “My Stem Cell Lab” sheet in front of them. This is “your lab,” where you will work on your own to differentiate three new kinds of cells.

2. **Deal the Cards**
   The person with the **next birthday** is the dealer. The dealer will:
   • **Take four Totipotent cards out of the deck.** Place them face-up in the middle of the table. This area is “the human body,” where all players will work together to differentiate cells.
   • **Shuffle the deck** of cards again.
   • **Deal four cards** to each player. This is a player’s “hand.” (Keep it hidden from other players!)
   • **Place the deck face down** in the middle of the table. This will be the “draw pile.”

   All players look at their hands. If you have any **Totipotent**, **Pluripotent**, or **Cell Death cards**, do the following:
   • Place a Totipotent card anywhere in the middle of the table.
   • Place a Pluripotent card next to any unattached Totipotent card. If there are none, hold onto your Pluripotent card until the next turn when you can play it.
   • Place a Cell Death card in the discard pile.

   Dealer then deals additional cards to players so everyone has four cards in their hands again. Repeat this step if you get another Totipotent, Pluripotent, or Cell Death card.

---

**CARD TYPE** | **CARDS PER DECK**
--- | ---
Totipotent Stem Cell | 18
Pluripotent Stem Cell | 18
Induced Pluripotent Stem Cell (iPS) | 18
Multipotent Stem Cell • Endoderm | 12
Multipotent Stem Cell • Mesoderm | 12
Multipotent Stem Cell • Ectoderm | 12
Differentiated Cell • Endoderm • Lung | 6
Differentiated Cell • Endoderm • Pancreas | 6
Differentiated Cell • Mesoderm • Heart Muscle | 6
Differentiated Cell • Mesoderm • Red Blood Cells | 6
Differentiated Cell • Ectoderm • Neuron | 6
Differentiated Cell • Ectoderm • Skin | 6
Cell Death | 4
Total # of Cards | 130
HOW TO PLAY

General Rules

The person to the left of the dealer takes the first turn. (Play proceeds clockwise.)

On a turn, a player may do one of the following:

- **Play** any number of cards in “the human body” and/or in “the lab” (see “Playing Cards: How to Make Chains” p.3). At the end of a turn, a player replenishes “the hand” by picking up one, two, three, or four cards from “the draw pile” so that “the hand” has four cards again.

- **Swap** any number of cards in your hand for an equal number of new cards from the draw pile. Place discarded cards face up in the “discard pile” (next to the draw pile). This action completes the turn.

- **Pass** if nothing can be played or you choose not to play a card.

**Note:** If the draw pile runs out of cards, shuffle the discard pile. Place it face down to become the new draw pile. **Shuffle thoroughly!**

**To win**, play until a player completes all three chains in the lab. The first scientist to make three new cells—one in each germ layer—wins!
Playing Cards: How to Make Chains

1. Play cards in “the human body” (middle of the table)

All players will first work together to differentiate cells in “the human body” by forming chains of cards. Any player can place cards on any chain in the middle of the table.

To form a “human body” card chain, place one or more cards, from left to right, in this order:

- Totipotent Stem Cell
- Pluripotent Stem Cell
- Multipotent Stem Cell
- Differentiated Cell

The Totipotent and Pluripotent cards are always the first two cards in the chain. In these two stages, the stem cell can still differentiate into any kind of specialized cell.

A Multipotent card is always the third card in the chain. The stem cell is now sorted into a germ layer. So you can play either an Ectoderm, a Mesoderm, or an Endoderm card.

A Differentiated Cell card completes the chain. The cell has developed into a specialized cell within a specific germ layer. So you can only play a:
- Lung or Pancreas card next to an Endoderm Multipotent card
- Heart or Red Blood Cells card next to a Mesoderm Multipotent card
- Skin or Neuron card next to an Ectoderm Multipotent card

TIP: Make sure the Multipotent and Differentiated cards in the same chain are the same color!

2. Play cards in “your lab” (on My Stem Cell Lab sheet)

Players will work on their own to differentiate cells in the lab by taking completed chains of cards from “the human body” to form new chains in the lab. Players can only place cards on their own lab sheets.

To start a chain in “your lab,” use an Induced Pluripotent (iPS) card from “your hand” to pick up a complete differentiated cell chain from “the human body.”

Stack all five cards, with the iPS card on top, and place the stack in one of the rectangles in the first column of “your lab.” (It doesn’t matter which row the stack is in; you can move it to another row later if you’d like.) You have now induced a differentiated cell back to a pluripotent stem cell in your lab! (See To Win, p. 2)

To form a “lab” card chain, place cards, from left to right, in this order:

1  -->  2  -->  3

An iPS card starts the chain. It can differentiate into a completely different kind of specialized cell!