

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!).

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

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

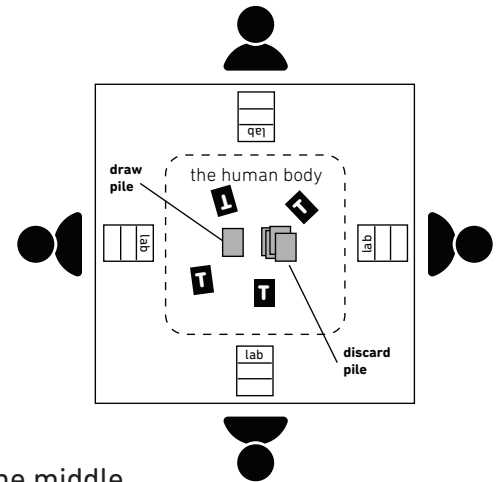
The person with the **next birthday** is the dealer. The dealer will:

- **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.



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.

OR

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.

OR

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!**

TOTIPOSENTS & PLURIPOTENTS

If you pick up either of these cards, you must play it in “the human body” immediately if possible. Then pick up another card from the draw pile so you end your turn with four cards. (Repeat this step as needed.)



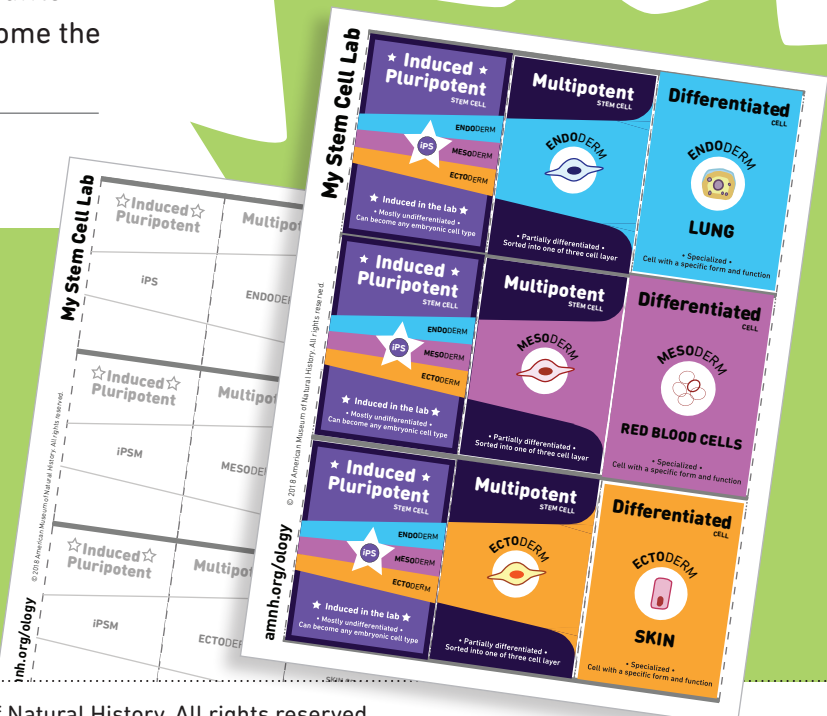
If no spots are available for the Pluripotent card, hold onto it until the next turn when you can play it.

CELL DEATH CARD

Cell Death cards must be played immediately on any unfinished chain in “your lab.” (**Once a “lab” card chain is complete, it is safe! You can’t play a Cell Death card on it.**) Grab the entire chain from your lab and place it in the discard pile. (If there are no unfinished chains to use it on then you are lucky! Simply discard it.)



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!

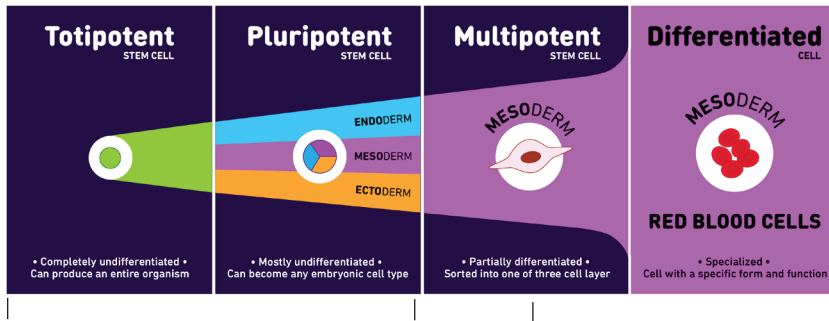


Playing Cards: How to Make Chains

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:



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

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.

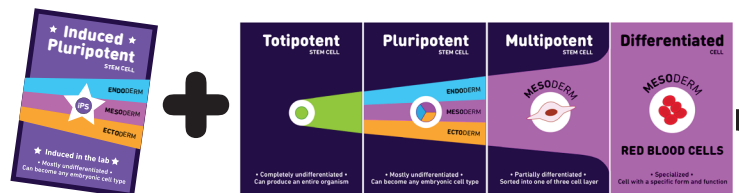
A **Multipotent** card is always the third card in the chain. The stem cell is now sorted into a germ layer. So you can play either an **Ectoderm**, a **Mesoderm**, or an **Endoderm** card.

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

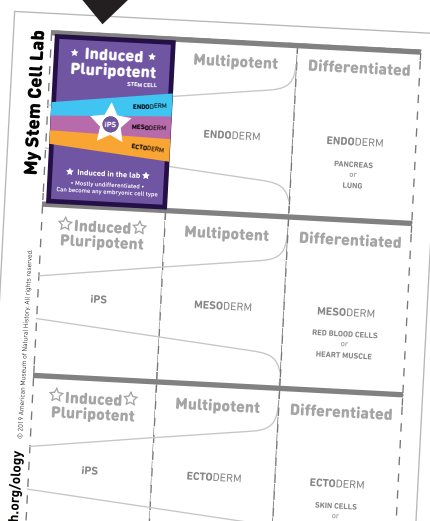
2. Play cards in “your lab” (on My Stem Cell Lab sheet)

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.”

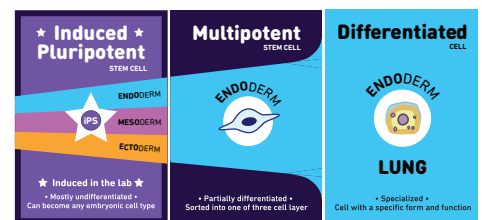


Stack all five cards, with the iPS card on top, and place the stack in one of the rectangles in the first column of “your lab.” (It doesn’t matter which row the stack is in; you can move it to another row later if you’d like.) You have now induced a differentiated cell back to a pluripotent stem cell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