

Macromolecule Synthesis Card Game

There are four major classes of molecules in organisms: **carbohydrates** (sugars), **lipids** (fats), **proteins** and **nucleic acids** (DNA and RNA). Each of these larger molecules is constructed from smaller building blocks, **monomers** (except lipids), by the process of **dehydration synthesis**. This results in bonds between those **monomers** and the creation of a large molecule.

In this game, the object is to construct as many macromolecules as you can. The winner is the person who has the most points at the end of the game!

Carbohydrates

The monomer of a carbohydrate is called a **monosaccharide**, an example of which is glucose. Some carbohydrates are made of only two monomers. Examples of **disaccharides** include sucrose (table sugar) and lactose (milk sugar). Potatoes possess large sugars molecules, **polysaccharides**, called starch.

Nucleic Acids

There are two types of nucleic acids in organisms: DNA and RNA. Both are made of combinations of **nucleotides**. The combination of nucleotides is unique to each individual and can be billions of nucleotides long!

Lipids

Lipids help to store energy, insulate the body, provide cushioning and make up cell membranes. Lipids are made of one **glycerol** molecule and three **fatty acids**. The special lipids that make up the cell membrane, **phospholipids**, are made of one glycerol, two fatty acids and one **phosphate**.

Proteins

Proteins are important in virtually everything a cell does. Organisms make the proteins they need from 20 different types of **amino acids**. Amino acids are joined to create **polypeptides** and can be hundreds, thousands or even more amino acids long.

The table below indicates the point values for each molecule formed:

You can build:	Constructed with “DEHYDRATION SYNTHESIS” and:	Point value:
Disaccharide	2 monosaccharides	1
Starch	2 monosaccharides + 1 “polymerize”	4
Lipid	1 glycerol + 3 fatty acids	3
Phospholipid	1 glycerol + 2 fatty acids + 1 phosphate	5
Dipeptide	2 amino acids	2
Polypeptide	2 amino acids + 1 “polymerize”	4
Nucleic Acid	2 nucleotides + 1 “polymerize”	4

Procedure and rules for the game of synthesis

(The dealer is the player who has the next birthday.)

1. The dealer will shuffle and deal five cards to each player.
2. Turn one card face up to start the discard pile. The other pile, face down, is the draw pile.
3. The person to the left of the dealer goes first by drawing either from the discard pile or the draw pile. He/she either plays or discards. Models are built, **one card at a time**, face up on the table in front of each player.
4. In order to begin building a macromolecule, a DEHYDRATION SYNTHESIS card must first be played. A new DEHYDRATION SYNTHESIS card must be used for **each** macromolecule that is built.
5. HYDROLYSIS cards may be used as a defense. If a HYDROLYSIS card is played on another player’s **completed molecule**, the molecule is broken down and all components are placed in the discard pile. That player also loses the points for the hydrolyzed molecule. The HYDROLYSIS card may only be used **twice** per game.
6. If a player constructs a molecule out of the wrong components, he/she will lose a turn.
7. ENZYME INHIBITOR cards may be played on other players’ molecules which are in the **process of being built**. A player may not build on the inhibited molecule and must use a INHIBITOR REMOVAL card to remove the ENZYME INHIBITOR card and continue construction of the molecule. The ENZYME INHIBITOR card may be used as many times as you like per game.

QUICK GUIDE to PLAY

1. **DRAW** the top card from the **DECK**, or the top card in the **DISCARD** pile.
2. **PLAY ONE** card to build a molecule, or **DISCARD ONE** card.
3. **SCORE** points if you finished a molecule. (**DEDUCT** points if one was broken one down.)