

Welcome to the PHYLO Phytochemical deck. This is a cool expansion pack that looks at important chemicals derived from plant specimens. In other words, it's not really a standalone playable\* PHYLO game but can be used with other PHYLO starter decks.

#### HOW TO USE:

It's pretty simple. The plant cards can be used as normal SPECIES cards (see <http://phylogame.org> for full explanation of rules). However, the chemical cards can also be used for one action where they can be played **under** your matching plant card (and only if the card is yours) - this is worth bonus points! Since the bonus points are significant, your opponent can ask you (at any time) to recall the name of the chemical associated with the plant. If you cannot recall the name (which should be hidden under the plant card), then you will have to discard your chemical card (i.e. you will have to memorize the name of the chemical)!\*\*

#### CREDITS

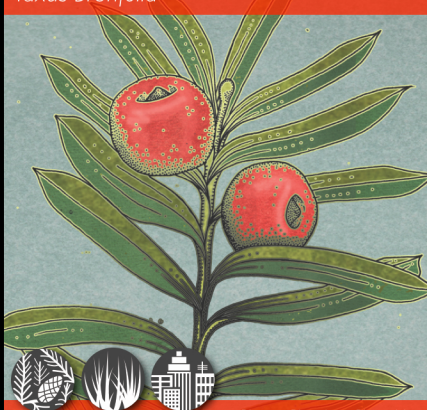
Concept and Research: Stephen McNeil - UBCO  
Art: Julia K. Kreutz - <http://juliakreutz.com/>

\*You could actually use this deck as a standalone game. Games like memory or go fish could be easily adapted.

\*\*You can also mod these rules. Maybe not just the name is required. Maybe the "uses" or even the ability to sketch the molecule out!

## PACIFIC YEW TREE 9

*Taxus brevifolia*



COOL WARM

Plantae, Pinophyta, Pinopsida

**FACT:** The drug Paclitaxel is isolated from the bark of the Pacific Yew Tree.

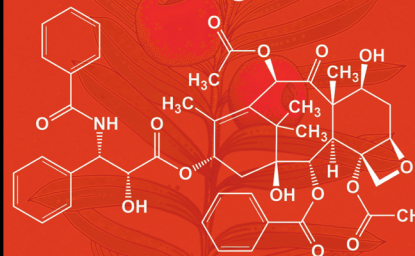
Image by Julia K. Kreutz  
<http://juliakreutz.com/>

2 POINTS

## PACLITAXEL (TAXOL)

$C_{47}H_{51}NO_{14}$

MW: 853.906 g/mol



(2 $\alpha$ ,4 $\alpha$ ,5 $\beta$ ,7 $\beta$ ,10 $\beta$ ,13 $\alpha$ )-4,10-bis(acetyloxy)-13-[(2R,3S)-3-(benzoylamino)-2-hydroxy-3-phenylpropanoyl]oxy]-1,7-dihydroxy-9-oxo-5,20-epoxytax-11-en-2-yl benzoate

**SOURCE:** Pacific Yew Tree.

**USE:** mitotic inhibitor; lung, ovarian, breast cancer chemotherapy.

**PLAY:** Place under source card for extra points.

Image by Stephen McNeil  
<https://people.ok.ubc.ca/wsmcneil/>

+5 POINTS

## MA HUANG

*Ephedra sinica*

6



COOL WARM

Plantae, Gnetophyta, Gnetopsida

**FACT:** The drugs ephedrine and pseudoephedrine are found in the Ma Huang plant.

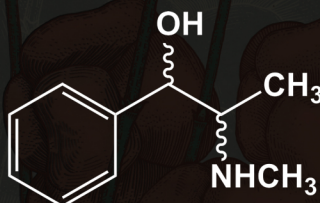
Image by Julia K. Kreutz  
<http://juliakreutz.com/>

2 POINTS

## (PSEUDO\*)EPHEDRINE

$C_{10}H_{15}NO$

MW: 165.23 g/mol



(R\*,S\*)-2-(methylamino)-1-phenylpropan-1-ol (ephedrine)  
(S,S)-2-methylamino-1-phenylpropan-1-ol (pseudoephedrine)

**SOURCE:** Ma Huang

**USE:** stimulant, bronchodilator, appetite suppressant.

(\* Pseudoephedrine is a diastereomer of ephedrine)

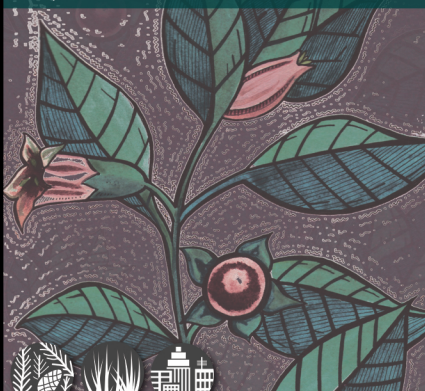
**PLAY:** Place under source card for extra points.

Image by Stephen McNeil  
<https://people.ok.ubc.ca/wsmcneil/>

+5 POINTS

## DEADLY NIGHTSHADE 7

*Atropa belladonna*



COOL WARM

Plantae, Angiosperms, Eudicots

**FACT:** The drug atropine is isolated from *A. belladonna*.

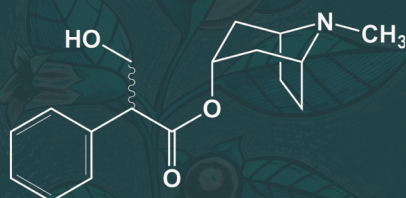
Image by Julia K. Kreutz  
<http://juliakreutz.com/>

2 POINTS

## ATROPINE

$C_{17}H_{23}NO_3$

MW: 289.369 g/mol



(R,S)-(8-methyl-8-azabicyclo[3.2.1]oct-3-yl) 3-hydroxy-2-phenylpropanoate

**SOURCE:** *Atropa belladonna*

**USE:** acetylcholine antagonist, pupil dilation, cardiac resuscitation, nerve gas treatment.

**PLAY:** Place under source card for extra points.

Image by Stephen McNeil  
<https://people.ok.ubc.ca/wsmcneil/>

+5 POINTS

## CINCHONA TREE 9

*Cinchona* genus



WARM HOT

Plantae, Angiosperms, Eudicots

**FACT:** The drug quinine is isolated from cinchona trees.

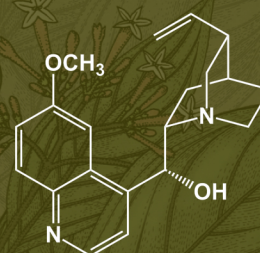
Image by Julia K. Kreutz  
<http://juliakreutz.com/>

2 POINTS

## QUININE

$C_{20}H_{24}N_2O_2$

MW: 324.417 g/mol



(R)-(6-Methoxyquinolin-4-yl)((2S,4S,8R)-8-vinylquinuclidin-2-yl)methanol

**SOURCE:** Cinchona trees.

**USE:** antipyretic, antimalarial

**PLAY:** Place under source card for extra points.

Image by Stephen McNeil  
<https://people.ok.ubc.ca/wsmcneil/>

+5 POINTS



## PENICILLIUM

2 I

*Penicillium chrysogenum*



Fungi, Ascomycota, Eurotiomycetes

COOL WARM

**FACT:** The antibiotic, Penicillin G, is derived from this species of fungus.

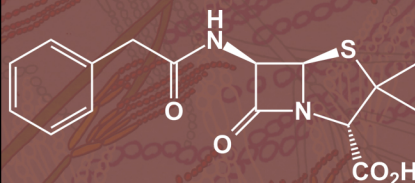
Image by Julia K. Kreutz  
<http://juliakreutz.com/>

2 POINTS

## PENICILLIN G

$C_{16}H_{18}N_2O_4S$

MW: 334.4 g/mol



(2S,5R,6R)-3,3-dimethyl-7-oxo-6-(2-phenylacetamido)-4-thia-1-azabicyclo[3.2.0]heptane-2-carboxylic acid

**SOURCE:** Penicillium species.

**USE:** antibiotic (also known as benzylpenicillin)

**PLAY:** Place under source card for extra points.

Image by Stephen McNeil  
<https://people.ok.ubc.ca/wsmcneil/>

+5 POINTS

## TOBACCO PLANT

7 I

*Nicotiana tabacum*



Plantae, Angiosperms, Eudicots

WARM

**FACT:** Tobacco contains the phytochemical: nicotine.

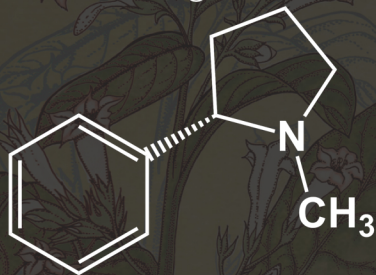
Image by Julia K. Kreutz  
<http://juliakreutz.com/>

3 POINTS

## NICOTINE

$C_{10}H_{14}N_2O_2$

MW: 162.23 g/mol



(S)-3-[1-Methylpyrrolidin-2-yl]pyridine

**SOURCE:** Tobacco plant.

**USE:** nicotinic acetylcholine agonist, stimulant

**PLAY:** Place under source card for extra points.

Image by Stephen McNeil  
<https://people.ok.ubc.ca/wsmcneil/>

+5 POINTS

## OPIUM POPPY

6 I

*Papaver somniferum*



Plantae, Angiosperms, Eudicots

COOL WARM

**FACT:** Opiates (such as morphine and codeine) are isolated from seeds of the poppy.

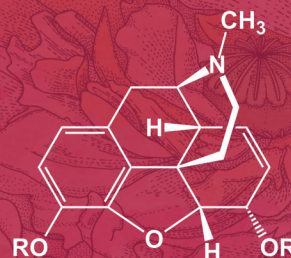
Image by Julia K. Kreutz  
<http://juliakreutz.com/>

2 POINTS

## MORPHINE/CODEINE

$C_{17}H_{19}NO_3$  /  $C_{18}H_{21}NO_3$

MW: 285.34 / 299.364 g/mol



(5α,6α)-7,8-didehydro-4,5-epoxy-17-methylmorphinan-3,6-diol  
(5α,6α)-7,8-didehydro-4,5-epoxy-3-methoxy-17-methylmorphinan-6-ol

**SOURCE:** Opium Poppy

**USE:** analgesic, precursor to heroin and methadone.

**PLAY:** Place under source card for extra points.

Image by Stephen McNeil  
<https://people.ok.ubc.ca/wsmcneil/>

+5 POINTS

## WHITE WILLOW

9 I

*Salix alba*



Plantae, Angiosperms, Eudicots

COOL WARM

**FACT:** The drug Salicin is isolated from the bark of the White Willow.

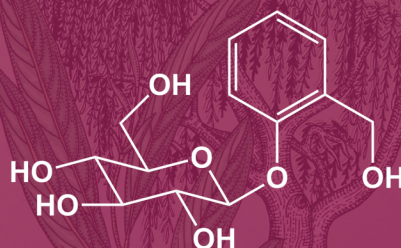
Image by Julia K. Kreutz  
<http://juliakreutz.com/>

2 POINTS

## SALICIN

$C_{13}H_{18}O_7$

MW: 286.28 g/mol



(2R,3S,4S,5R,6S)-2-[(hydroxymethyl)-6-[2-(hydroxymethyl)phenoxy]oxane-3,4,5-triol

**SOURCE:** White Willow.

**USE:** precursor to Aspirin, antipyretic, analgesic, anti-inflammatory

**PLAY:** Place under source card for extra points.

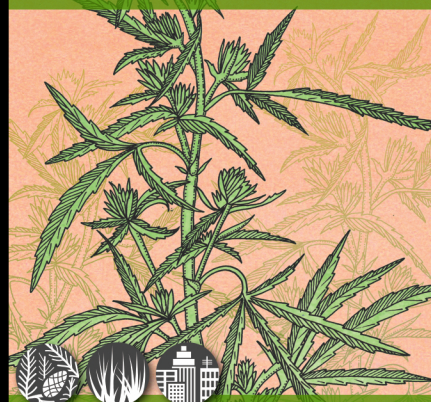
Image by Stephen McNeil  
<https://people.ok.ubc.ca/wsmcneil/>

+5 POINTS

## CANNABIS SATIVA

7 I

*Cannabis sativa*



Plantae, Tracheophyta, Magnoliopsida

COOL WARM

**FACT:** The drug tetrahydrocannabinol is isolated from *Cannabis sativa*.

Image by Julia K. Kreutz  
<http://juliakreutz.com/>

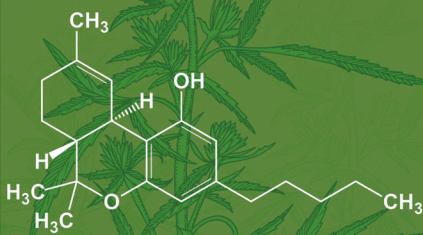
2 POINTS



## $\Delta^9$ TETRAHYDROCANNABINOL

$C_{21}H_{30}O_2$

MW: 314.469 g/mol



(-)-(6aR,10aR)-6,6,9-Trimethyl-3-pentyl-6a,7,8,10a-tetrahydro-6H-benzo[c]chromen-1-ol

**SOURCE:** *Cannabis Sativa*

**USE:** psychotropic, mild analgesic, appetite stimulation.

**PLAY:** Place under source card for extra points.

Image by Stephen McNeil  
<https://people.ok.ubc.ca/wsmcneil/>

+5 POINTS