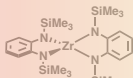
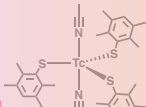
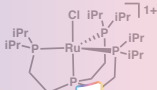
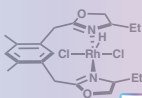
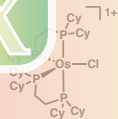
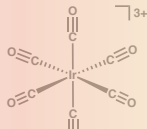
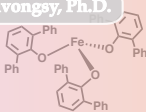
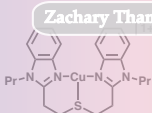
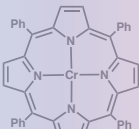
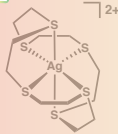
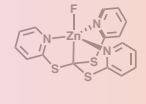
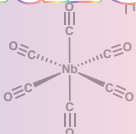
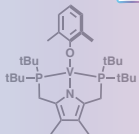


# COMPLEX

An Inorganic Game



# Rulebook



Zachary Thammavongsy, Ph.D.

# BACKGROUND

Inorganic complexes are fascinating in that they have many unique characteristics. A chemistry student can describe an inorganic complex by the charge of the transition metal, the denticity of the ligand, the donor groups, the geometry, the electron count, and the list goes on and on. With many combinations of ligands and metals, students should be exposed to as wide a variety of complexes as possible. This game will allow chemistry students the chance to identify many existing complexes in the literature.

## OBJECTIVE

The learning objective of this game is to identify the characteristics of an inorganic complex and effectively communicate those characteristics with other players. Players will use inorganic chemistry terminology to bolster their inorganic communication skills and to expand their ligand knowledge profile. Chemistry students will work in teams and must learn to be efficient in their word choice.

## COMPONENTS



23 KEY  
CARDS

( INCLUDES A  
CARD HOLDER )



96 COMPLEX  
CARDS

( CSD REF CODE  
BOTTOM LEFT )



15 COVER CARDS



1 INSTANT  
ELIMINATION  
CARD



# SET-UP



**TEAM T**

(TETRAHEDRAL)

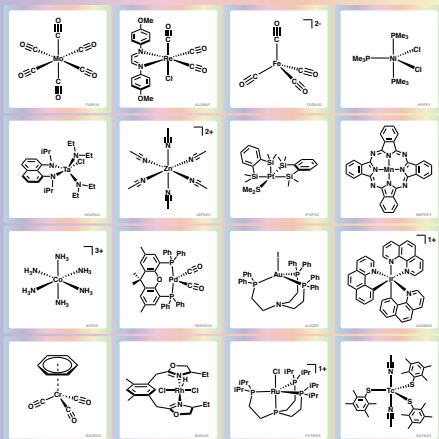


**CLUE GIVER  
SIDE**



**TEAM O**

(OCTAHEDRAL)



**TEAM T**

**GUESSERS  
SIDE**



**TEAM O**

# KEY CARD

## TEAM O

**O = Octahedral**

Yellow / Green  
background  
means Team O  
goes first



## TEAM T

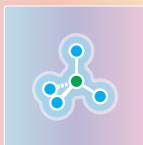
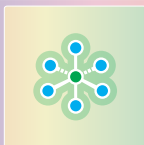
**T = Tetrahedral**

Blue / Purple  
background  
means Team T  
goes first



There are Key Cards corresponding to each team. One Key Card will be played per game until a team is determined as the winner. The outside color on the Key Card indicates which team goes first. Only Clue Givers may see the Key Card.

# DOUBLE CARD



One Cover Card will have a print of Team O on one side and Team T on the other. This card will go to the team that gets to go first because the team that goes first will have one more complex to guess than the team that goes second.

# INSTANT ELIMINATION



The Instant Elimination Card is positioned in the middle between the two Clue Givers. This card is used only if a Guesser selects a Complex Card corresponding to the Instant Elimination Card on the Key Card. The game is automatically over, and the team who chose the Instant Elimination card loses.

# GAME PLAY

## STEP 1

**Provide Clue** - A team will provide a one or two-word clue, followed by a number (maximum amount of guesses).

## STEP 2

**Select Complex** - Teammates of the Clue Giver will then select (by touching the card) the complex they believe correspond to the clue.

## STEP 3

**Cover Answer** - Clue Giver will cover the Complex Card with their team's Cover Card if the selection was correct or with the other team's Cover Card or Instant Elimination Card if their selection was incorrect.

## REPEAT

If the selection was correct, the same team can repeat steps 2 and 3 until they guess the other team's Complex Card or until they reach their maximum amount of guesses, which is the number the Clue Giver provides after the clue.

# WINNER

The team that first covers all their complexes wins the game or the team that picks the instant elimination complex loses the game.

# STEP 1

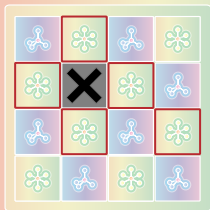
## PROVIDE CLUE

Clue Giver provides a one or two-word clue to their teammates, followed by a number.

Example...

Team O goes first to provide a clue.

Both Clue Givers will decide how they want to orient the Key Card relative to the Complex Cards on the playing field.



The Clue Giver for Team O wants to provide a clue corresponding to five Complex Cards in the red highlighted section above.

Team O's Clue Giver would say...

**“bidentate, five”**

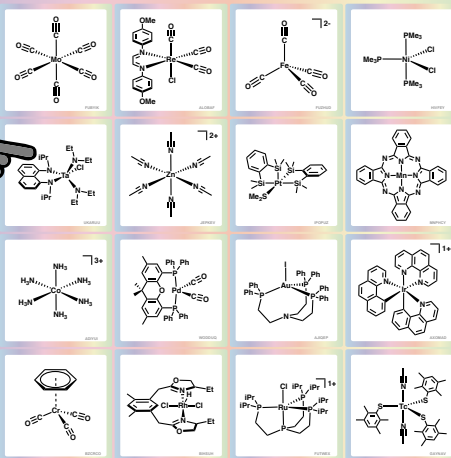
# STEP 2

# SELECT COMPLEX

Guessers will then try to select which complexes correspond to the clue by touching the Complex Card one at a time.



Team O  
will have  
one  
Guesser  
touch  
the  
Complex  
Card.



Touching multiple Complex Cards at once will automatically end your team's turn.

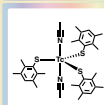
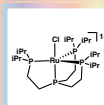
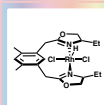
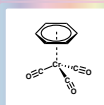
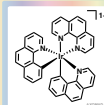
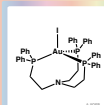
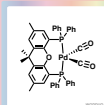
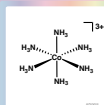
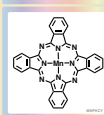
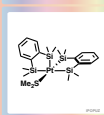
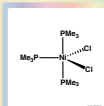
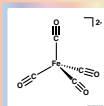
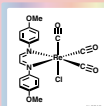
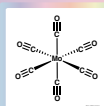
# STEP 3

# COVER ANSWER

Cover the selected Complex Card with the appropriate Cover Card.

If the selected Complex Card corresponds to Team O's Cover Card on the Key Card, then the Clue Giver will cover that Complex Card with Team O's Cover Card, and the Guessers can choose another Complex Card.

Team O's  
Cover Card  
is placed  
on top of  
the  
selected  
Complex  
Card,  
mirroring  
what is  
shown on  
the Key  
Card.

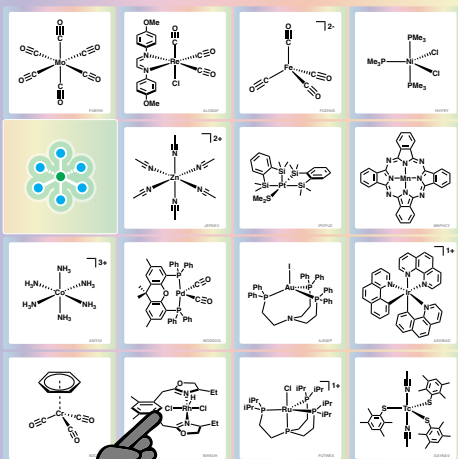




# REPEAT STEP 2

# SELECT COMPLEX

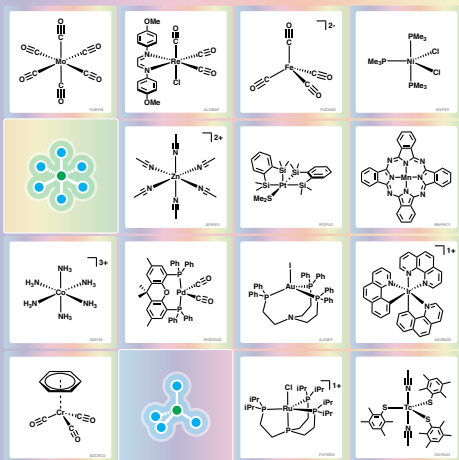
Guessers can continue to select up to the maximum amount of Complex Cards (in this example, five). However, if Team O selects a Complex Card corresponding to the other team's Card Cover on the Key Card, the turn is immediately over, and Team T will begin from step 1.



# REPEAT STEP 3

# COVER ANSWER

Team O's guess was incorrect, placing down the Cover Card instead for Team T. Now it is Team T's turn to go, starting with step 1.



\*The team that selects the Complex Card corresponding to the Instant Elimination Card will automatically lose the game. Start the game over with a fresh batch of Complex Cards.

# WORD CLUE

The Clue Givers can only provide a one or two-word clue. Any hyphenated words will count as two words. The clue must be a word within the scientific community or found in a dictionary. Certain words will be forbidden to use as clues.

Forbidden Clues - Row, Column, and Name of Elements. The name of ligands is allowed, such as bisphosphines, amines, or carbonyl.

## SUGGESTED WORD CLUES

### ***d-Count***

1.  $d^0$
2.  $d^1$
3.  $d^2$
4.  $d^3$
5.  $d^4$
6.  $d^5$
7.  $d^6$
8.  $d^7$
9.  $d^8$
10.  $d^9$
11.  $d^{10}$

### ***Oxidation State***

1. +1
2. +2
3. +3
4. +4
5. +5
6. +6

### ***Ligand Denticity***

1. Monodentate
2. Bidentate
3. Tridentate
4. Tetradentate

### ***Ligand Donor***

1. Anionic donors
2. Neutral donors
3. Soft donors
4. Hard donors
5. Strong/Weak donors

### ***Ligand Field***

1. Weak Field
2. Strong Field

### ***Overall Charge***

1. Neutral Complex
2. Charged Complex
3. Negatively Charged
4. Positively Charged

### ***Geometry***

1. Linear
2. Trigonal Planar
3. Pyramidal
4. Tetrahedral
5. Square Planar
6. Square Pyramidal
7. Trigonal Bipyramidal
8. Octahedral

### ***Electron Count***

1.  $16e^-$
2.  $17e^-$
3.  $18e^-$
4.  $19e^-$

### ***Other Consideration:***

Point Groups  
Soft/Hard Metal  
Stereoisomers  
Complex Color  
Ligand Nomenclature

# FORBIDDEN HINTS

Clue Givers are forbidden to provide hints outside of the one or two-word clue. These forbidden hints include body language (pointing, winking, shaking, dancing, or head-nodding), noises (coughing or humming), or other forms of communication.

## SELECTION RULE

Pick only one Guesser per team to be the representative selector. That person can only touch one Complex Card at a time, providing enough time for the Clue Giver to respond with the appropriate Card Covering.

## CONTINUOUS GAMEPLAY

If time permits, you can play more games. The team that wins the majority of the Key Cards will be determined as the winner.

## CREDITS

Game Designer:

Zachary Thammavongsy, PhD

Mikhail Konev, PhD

"Complex" is a variation of the hit game "Codenames"

## LEGAL

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