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Game Rules: Alchemical Conversions

Play your cards right and you might make gold!

Alchemical Conversions is a card game where you become an Alchemist seeking to create gold. Players will find themselves in an Alchemist's Laboratory with their very own workstation, where they will use the materials at their disposal and their knowledge of converting different units to produce as much gold as possible. However, gold can only be created if you successfully can move from one material unit to another. Can you rise to the challenge and make more than your classmates? Enter the Laboratory and find out!

Details:

Players: 3-4
Average Duration of a Single Round: 4-6 Minutes
Average Duration of a full game: Around 15 Minutes
Target Audience: Early High-School students in STEM Classrooms

Unit Conversions:

Unit conversions are a very important skill that is often used in both Science and Math classrooms across all school levels. Additionally, it is a skill that is important to know for life as well, as it is very common in many activities whether we realize it or not. As the name suggests, a unit conversion is when one form of measurement is changed to another. A unit conversion is completed by multiplying fractions, and ordering the equation so that the necessary units cancel eachother out by being present both in the numerator and the denominator. Alchemical Conversions assists students in their practice of ordering unit conversions and noticing patterns in their values.

Game Materials:

1 deck of a 52 *Alchemical Conversions* Cards OR a regular 52 4-Suit Card Deck
- If playing with *Alchemical Conversions* Cards, the suits are Distance (D), Time (T), Volume (V), Weight (W), ranging from 1-13
- If playing with a regular 52 4-Suit Card Deck:
    - Ace → 1, Jack → 11, Queen → 12, King → 13

1 Set of Unit Cards (2 of each in a complete set)
1 Calculator
4 Playaids (with win condition example)
4 Printable Alchemist Workstations (Playmats)
- If unable to obtain, follow the example below to make DIY playmats with regular paper:
    - n → numerator, d → denominator

Starting Unit:	Space for card n1	x	Space for card n2	x	Space for card n3	x	Space for card n4	Ending Unit:
	Space for card d1		Space for card d2		Space for card d3		Space for card d4	

Game Setup/Procedure:

1. Distribute the Playaids (and playmats if needed) to each player.
2. From the Suit deck, give each player two cards to represent their starting and ending unit. Players can decide what unit is their beginning or ending unit.
3. Shuffle your deck of cards, and then deal out 5 cards to each player.
4. Round Procedure:
    a. During each round, all players make their move simultaneously. At the start of each round, players have this option:
        i. Choose one of the 5 cards to play onto one of the spaces into their workshop, FACE DOWN.
    b. Once every player has played a card, everyone reveals their card.
    c. Once all cards have been revealed, players pass their cards CLOCKWISE.
    d. Once all players have received a new hand, they draw a card from the deck to fill their new hand to 5 cards.
    e. Rounds continue until all players have successfully filled their Workstations
    f. Once the round ends, points (gold) distributed as follows
        i. 2 points: complete conversion and highest number (use calculator to solve if not immediately noticeable)
        ii. 1 point: complete conversion
        iii. 0 points: not a complete conversion
    g. Repeat until one player hits 5 points/pieces of gold, that's the winner!

Key Mechanic:

1. Canceling Out Units, Complete Boards
    a. In order to get gold, units/suits of the cards players place onto their workshop must correctly cancel eachother out. This works the same as real unit conversions: for every time a unit is represented in the numerator, it must also be in the denominator of the conversion expression. In the beginning of the game this is easier, since players have more space on their board. However, as they play more cards, their options for canceling out units becomes more difficult. Examples of completed boards are below:

Complete Solution:

Starting Unit: Time	7 D	x	10 T	x	7 L	x	3 M	Ending Unit: Mass = 122.5 (Mass)
	2 T		A T		2 D		3 L	

Same Solution, but when using a traditional 52 card deck:

Starting Unit: ♣	7 ♦	x	10 ♣	x	7 ♠	x	3 ♥	Ending Unit:♥ = 122.5 ♥
	2 ♣		A ♣		2 ♦		3 ♠	

2. Other Important Notes:
    a. If a player has one slot left on their board, they must play the next possible card they can.
    b. If a player finishes their board first, they continue in the rounds with the others and continue to pass cards. The game only ends once all players are finished.

<u>Learning Goals & Debrief:</u>

The learning goal of Alchemical Conversions is to have students become more comfortable with the general process of unit conversions, something that has so much use both in the classroom and in the real world. Students can often get confused with the different units and complicated phrasing, but in this version Alchemical Conversion seeks to strip down this stem practice into its most simple form with an alternative/fantasy theme that does in fact also use conversions as well. The structure of the game mirrors exactly how students would complete unit conversions in other tasks in their STEM classes. Here are some debrief questions:

1. How well do you understand the concept of unit conversions, on a scale of 1-10?
2. What is a pattern you notice in the way you play the game?
3. How do you think that pattern relates to how unit conversions work?

Play Aid:

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Complete Solution:

Starting Unit: Time	7 D / 2 T	x	10 T / A T	x	7 L / 2 D	x	3 M / 3 L	Ending Unit: Mass = 122.5 (Mass)

Same Solution, but when using a traditional 52 card deck:

Starting Unit: ♣	7 ♦ / 2 ♣	x	10 ♣ / A ♣	x	7 ♠ / 2 ♦	x	3 ♥ / 3 ♠	Ending Unit:♥ = 122.5 ♥

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