

HOW TO ESCAPE

5 doors, each a puzzle in its own right – several have more than one part.

1. Work every part of a door on this pack and build its code.
2. Type the code into the terminal to open the door.
3. Write down the key digit it gives you.
4. Combine all 5 key digits into the master override and escape.

TEAM NAME

TERMINAL

🔒 DOOR 1 PARTICLE THEORY

CENSUS

These elements were logged. Work through them one at a time.

N

Cu

Hg

Ne

Fe

O

K

Br

How many are **liquid at 25 °C**?

How many are **gases at 25 °C**?

Code = the counts in that order. Careful: a solid can still be diatomic, and not every gas is diatomic.

DOOR
CODE

KEY
DIGIT

Part 1. Work out the structure of each substance from its properties.

ionic = 1 · simple molecular = 2 · giant covalent = 3 · metallic = 4

Sub.	m.p. / °C	Conducts (solid)	Conducts (molten)	In water	Other	Type
W	1400	no	yes	dissolves	hard crystals	
X	-95	no	no	insoluble	gas at room temp	
Z	660	yes	yes	insoluble	shiny metal	

Door code = the structure types, read in order.

DOOR
CODE

KEY
DIGIT

Part 1. The metal samples, each with an **ID number**, were added to solutions of the others' sulfates (the columns). ✓ = a reaction, ✗ = none, · = not tested. The ID numbers are only labels.

ID ↓	2	6	9
2	—	✗	✓
6	✓	—	✓
9	✗	✗	—

Put the ID numbers in order from **most** to **least** reactive – that sequence is the code.

Door code = the ID numbers, most to least reactive.

DOOR
CODE

KEY
DIGIT

🔒 DOOR 4 RUSTING

RANKING

Every tube holds an identical iron nail. **Rank only the tubes that rust**, fastest first, and read their numbers in that order. Leave out any that will not rust at all.

TUBE 7

strong salt water, open to the air

rank

TUBE 3

weak salt water, open to the air

rank

TUBE 1

plain water, open to the air

rank

TUBE 4

plain water with a drying agent,
sealed

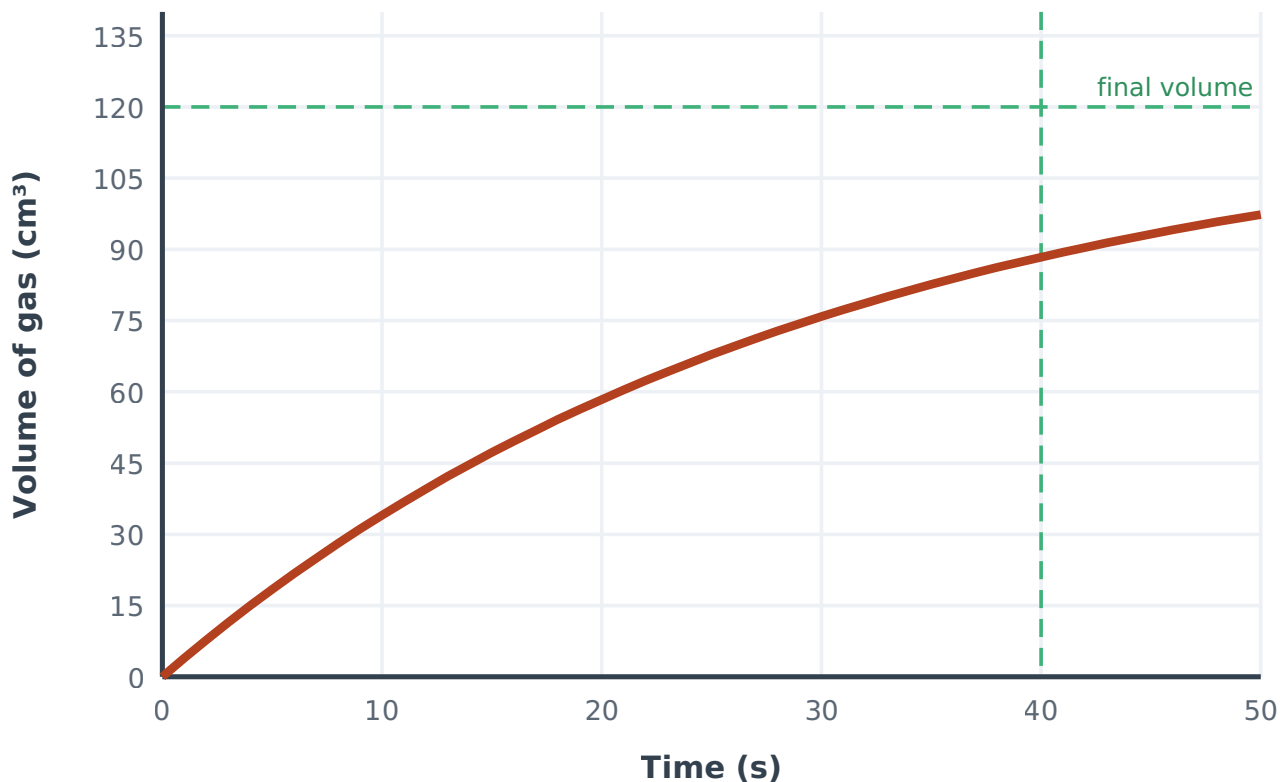
rank

Both water and oxygen are needed to rust; dissolved salt speeds it up. Watch for traps.

DOOR
CODE

KEY
DIGIT

The graph shows the gas given off as marble chips react with dilute acid.



1 Final (maximum) volume of gas, in cm^3

2 Average rate over the whole reaction, in cm^3/s

Door code = the answers in order. The green lines mark the final volume and the time the reaction finishes.

DOOR
CODE

KEY
DIGIT

Each clue gives only a **type** of element. Exactly one element of that type is hidden in the grid – **find it**, then write the **first letter** of each element. Enter them in order 1-4 for the code.

O	A	J	V	Q	S	B	G	E	D	R	R	X
Z	T	Z	F	Y	B	D	M	A	Z	A	S	I
Z	K	X	Q	Z	D	C	U	J	D	H	N	M
A	X	I	B	W	A	O	I	Q	I	E	S	R
N	L	V	O	V	K	A	S	X	X	Q	P	Y
B	R	O	M	I	N	E	S	Q	B	E	Y	Y
Z	T	N	B	C	P	W	A	Y	X	U	D	R
R	A	X	V	A	T	L	T	N	I	N	D	G
C	U	X	H	L	K	T	O	B	A	I	H	V
B	O	L	P	C	U	B	P	R	L	C	H	Q
O	W	C	K	I	J	N	U	W	P	K	L	U
G	M	W	Q	U	H	K	Y	S	W	E	K	N
I	B	I	I	M	X	J	D	G	K	L	N	G

1. A Group 1 metal
2. A Group 2 metal
3. A transition metal
4. A Group 7 element (a halogen)

CODE

The clue only tells you the group – the grid tells you which element it is.

MASTER OVERRIDE

Every door green? Write your key digits in order, then enter the master code to escape.

DOOR 1 DOOR 2 DOOR 3 DOOR 4 DOOR 5

Enter codes at: _____

Command Challenges (optional finals), shared by all groups — answers: The Core → **SHUT IT DOWN** (atomic numbers to letters). Chain Reaction → **212** g (steps: 44, 2, 48, 4, 160, 212). The Unknown → **CaBr₂** (calcium + bromide; $0.025 : 0.05 = 1 : 2$). Deadlock → **57492** (1 iron, 2 sodium chloride, 3 copper(II) sulfate, 4 zinc, 5 calcium carbonate).