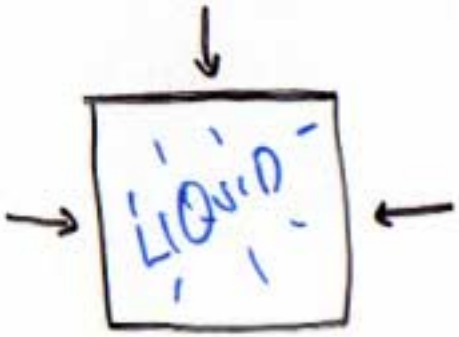
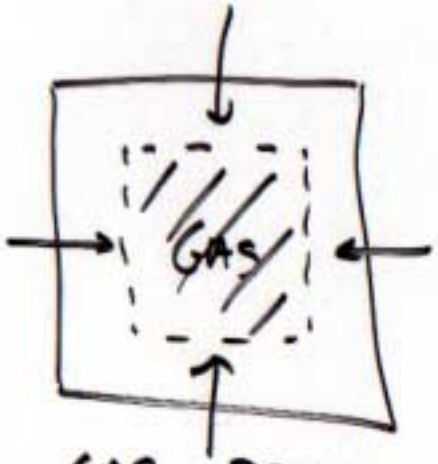
☐ LIQUID AND GAS

WHAT'S DIFFERENT?



LIQUID:
CAN'T CHANGE
VOLUME (MUCH).

V = CONST
- NO MATTER WHAT P IS



GAS: PRESS ON IT,
+ YOU CAN CHANGE
THE VOLUME.

PV = CONST.

MACROSCOPIC

DENSE

ALWAYS MOVING - BUT LIKE A CROWDED CONCERT

PARTICLES ARE JAMMED TOGETHER

NOT SO DENSE

ALWAYS MOVING, BUT LIKE ALMOST EMPTY PARK

LOT'S OF EXTRA ROOM

MICROSCOPIC

☐ WHY ARE LIQUIDS DENSE?

LIQUIDS "FILL SPACE" - NO EXTRA ROOM TO MOVE AROUND.

THERE IS A FORCE BETWEEN LIQUID (+ GAS!) ATOMS BRINGING THEM TOGETHER!

ALL THESE ADHESIVE FORCES CAUSE ATOMS TO STICK TOGETHER - ULTIMATE SOURCE IS ELECTRIC CHARGES.

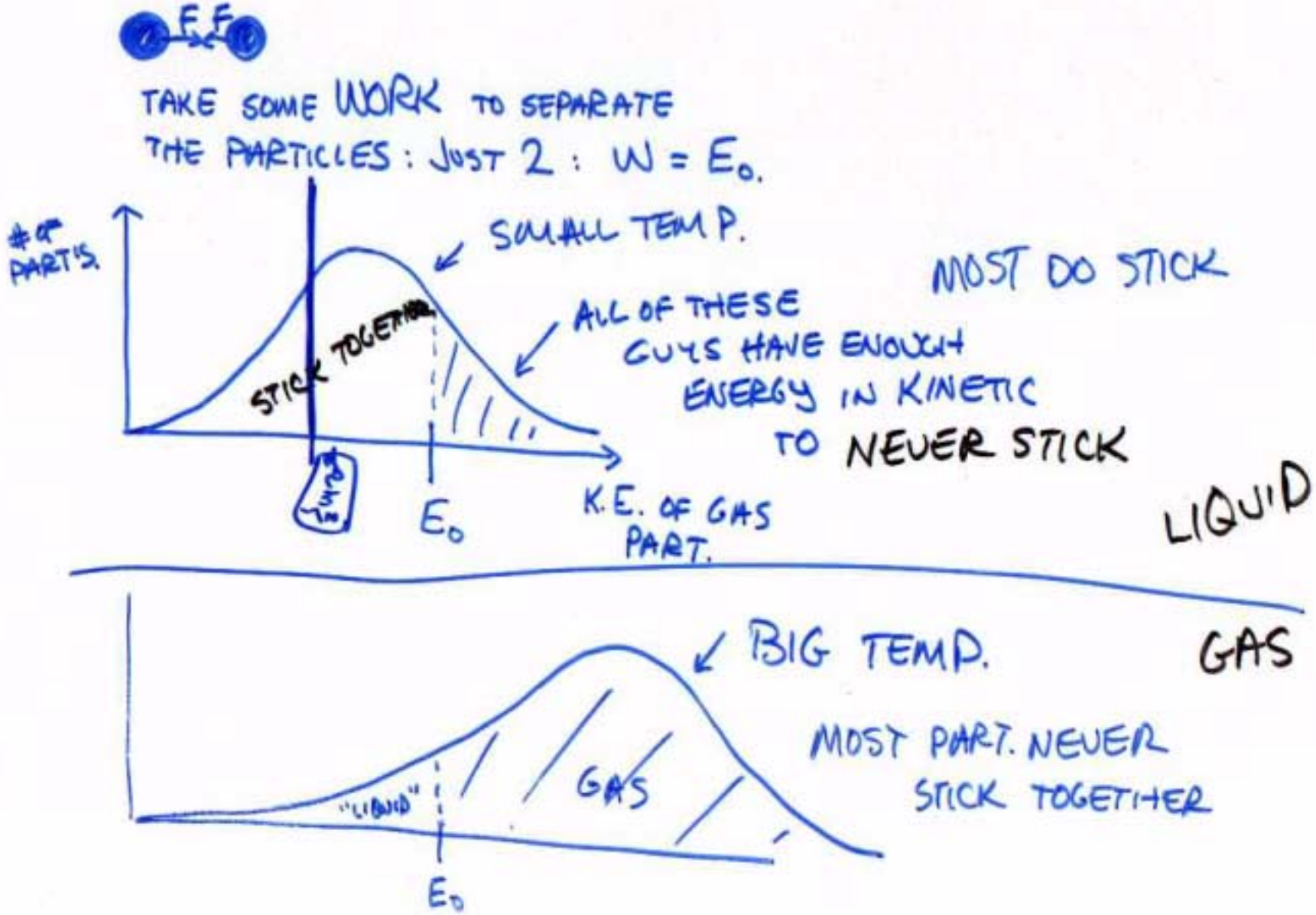
SO - WHY IS A LIQUID DENSE, & NOT A GAS?

LIQUID - SMALL T - SMALL MOTION OF PART'S

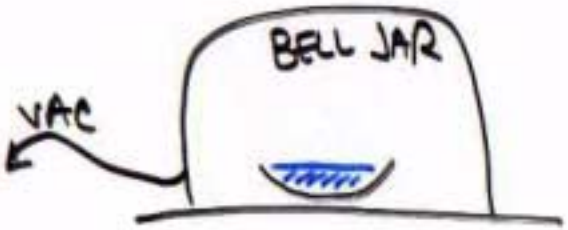
INCREASE TEMP, & OVERCOME THE STICKY FORCES!

PART. HAVE TO BE MOVING SLOW TO STICK.

☐ ENERGY PERSPECTIVE:



☐ VACCUME EXPT:

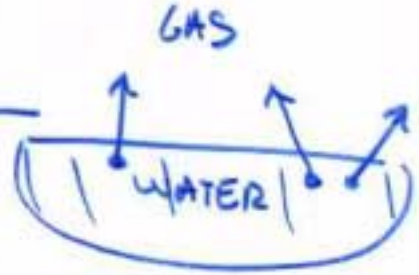


① TURN ON VAC, + WATER BOILED.

WHY?

AT "HIGH" PRESSURE - ATMOSPHERIC,
IF A WATER MOLECULE TRIES TO
LEAVE THE LIQUID, IT BOUNCES
INTO AN AIR MOLECULE + GETS REABSORBED

REMOVE THE AIR:



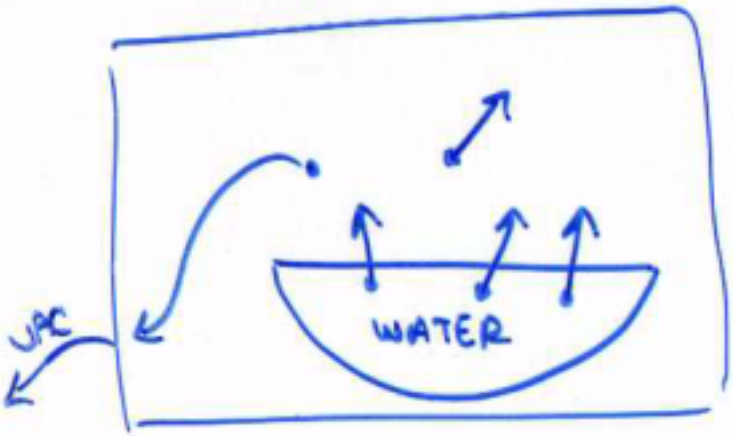
"BOILS"
REALLY IS
BOILING: LIQUID
TO GAS!

EVERYTIME ● GETS
ENOUGH KE IT
LEAVES THE
WATER
FOREVER.

☐ VACCUME EXPT.

② LEAVE THE VAC ON, + WATER FREEZES!?!

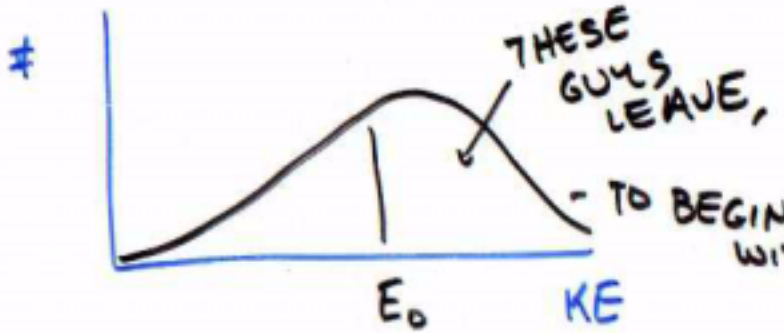
WHY?

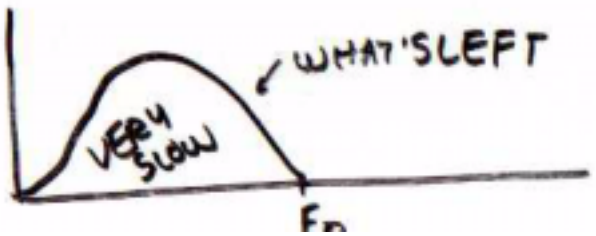


WITHOUT THE AIR, ONLY FAST WATER MOL. ~~CAN~~ HAVE ENOUGH ENERGY TO GET OUT OF THE LIQUID. THEY GET SUCKED OUT BY THE VAC.

EACH ONE TAKES SOME KE WITH IT.

WATER LEFT BEHIND HAS GOT LESS KE - ∴ COLDER + EVENTULLY FREEZES!



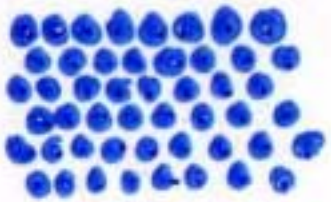


SLOW ENOUGH TO FREEZE —

☐ WHAT'S FREEZING? LIQUID GOES TO SOLID

"COOL"

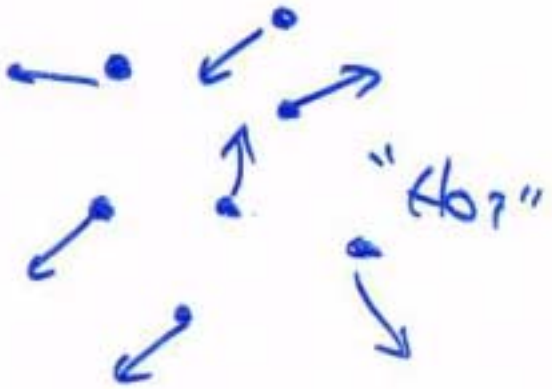
LIQUID
FILLS SPACE,
DISORDERED
STILL MOVING



"COLDEST"

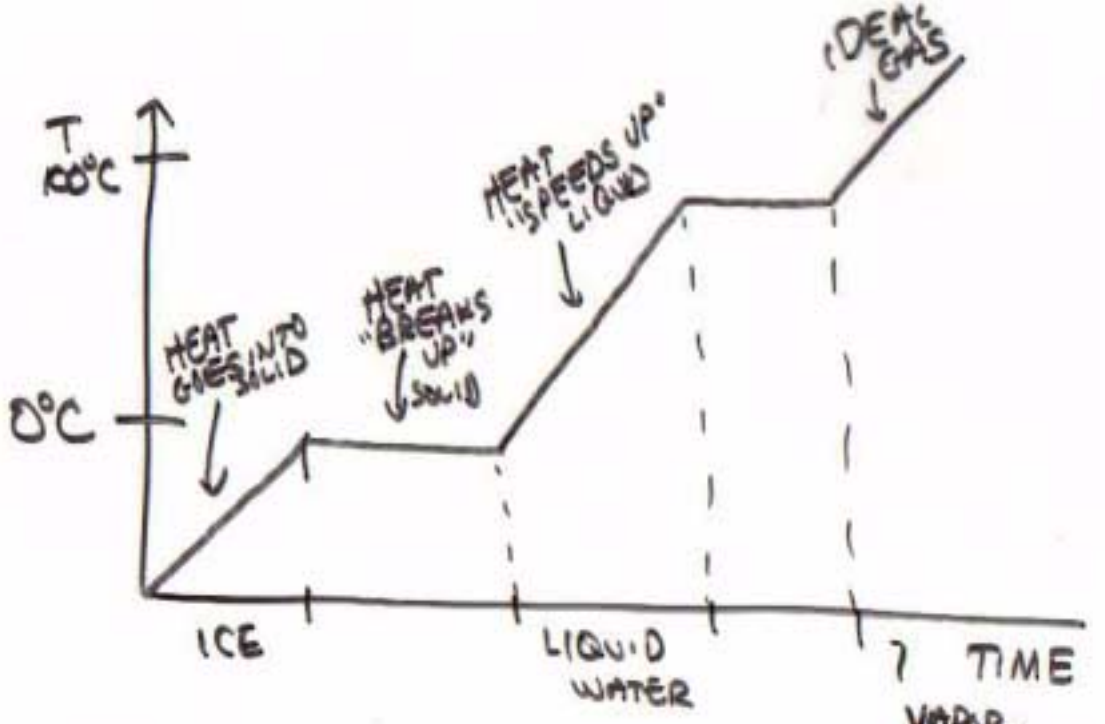
SOLID
FILLS SPACE
ORDERED
VERY LITTLE
MOTION

RATTLES AROUND A BIT.



"HOT"

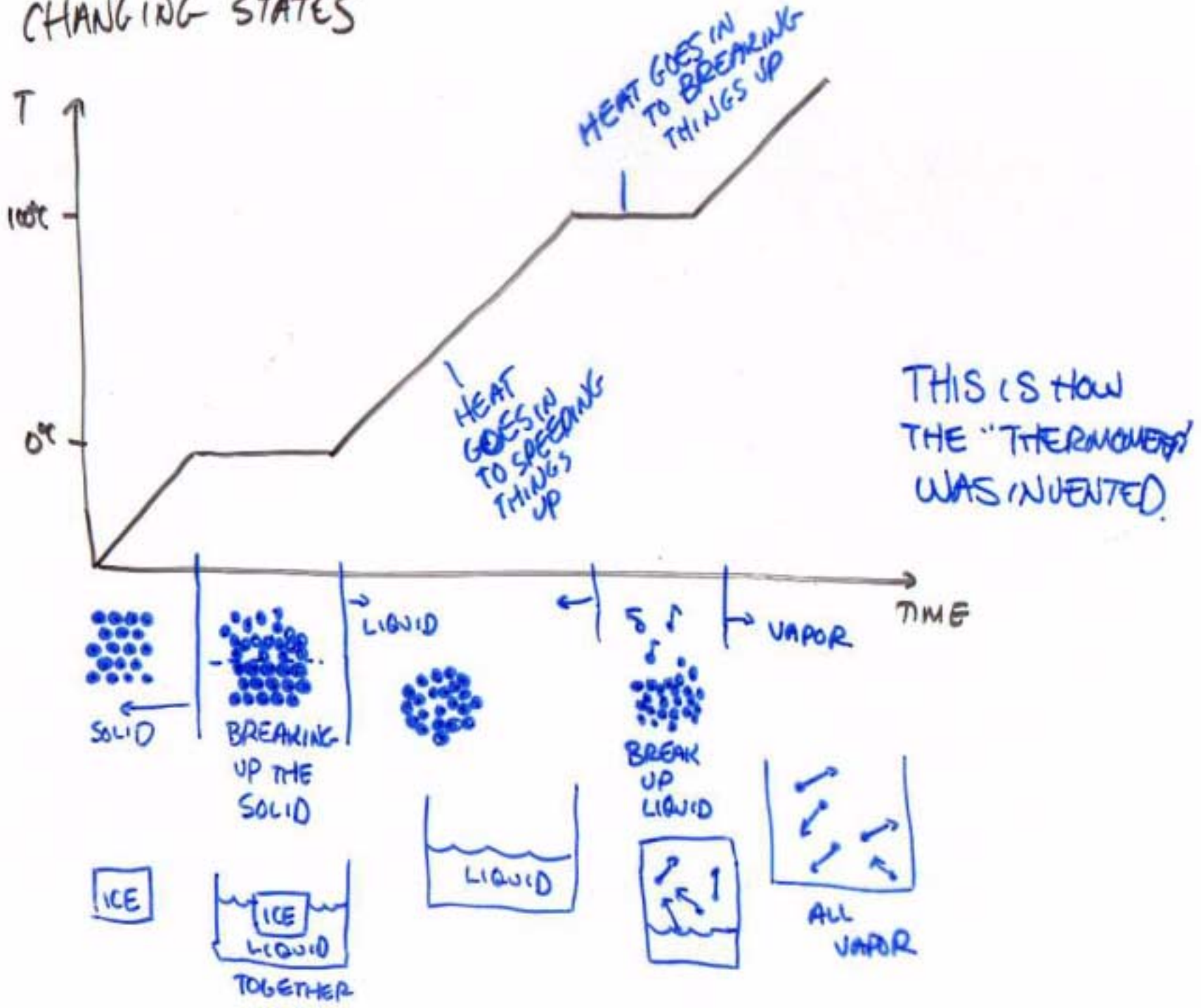
☐ USING T TO CHANGE THE STATE OF A SUBSTANCE:



SO, AS TIME GOES BY, HEAT GETS ADDED TO THE "STUFF"

USE WATER AS AN EXAMPLE.

☐ CHANGING STATES



THIS IS HOW THE "THERMOMETER" WAS INVENTED.