

D - N EXPLANATION:

A deductive argument whose premises include at least one "law of nature" and whose conclusion is the fact to be explained.

AN IMPORTANT SCIENTIFIC APPLICATION:

INTERTHEORETIC REDUCTION (using one theory to give a "deeper" explanation of a fact explained by another theory).

ORIGINAL EXPLANATION:
Facts described using theory 1
Natural laws invoked by theory 1

∴ Fact to be explained

To "REDUCE" THEORY 1 TO THEORY 2,
NEED TO USE THEORY 2 TO REDESCRIBE
THESE FACTS AND NATURAL LAWS.

NEW EXPLANATION:

Facts described using theory 1.

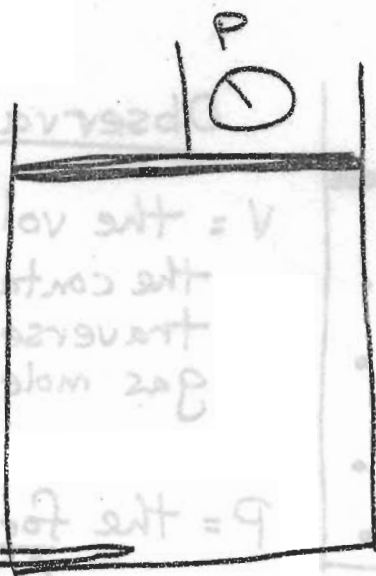
Redescription of facts using theory 2.

Natural laws invoked by theory 2.

∴ Fact to be explained

AN ILLUSTRATION

GAS IN A PISTON (Macroscopic view)

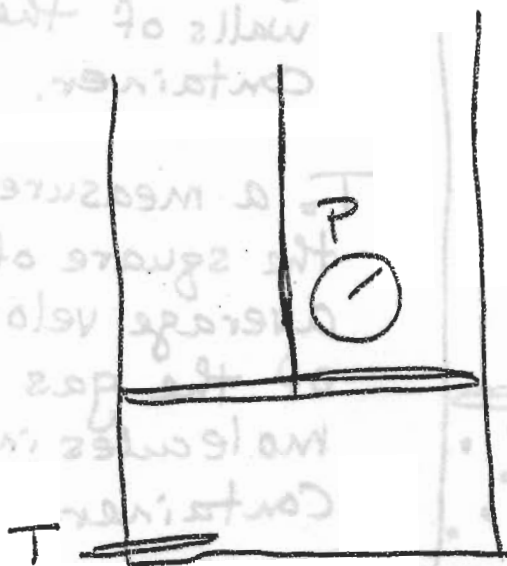


Observables

Volume (V)

Pressure (P)

Temperature (T)



"Ideal Gas Law"

$$PV = nRT$$

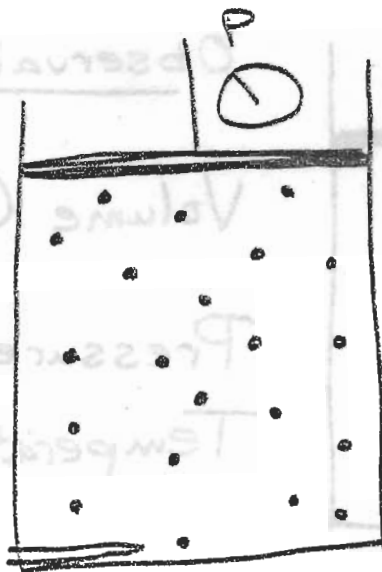
↑ ↑
a constant

related to amount
of gas in cylinder

GAS IN A PISTON (Kinetic theory of gases)

ASSUMPTIONS

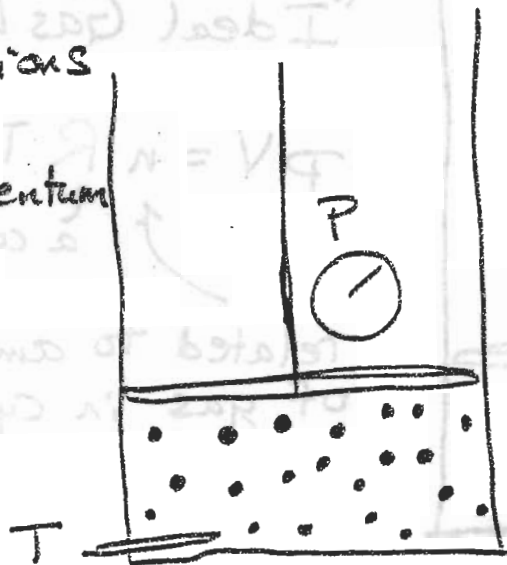
- Gas molecules move around uniformly in the container.
- Gas molecules collide with each other & walls of container.
- These collisions are elastic (i.e., no momentum is lost).



Observables

V = the volume of the container traversed by the gas molecules.

P = the force generated by collisions of gas molecules with walls of the container.

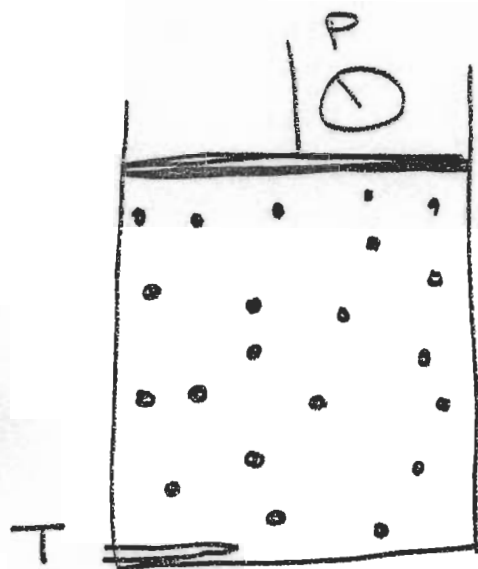


T = a measure of the square of the average velocity of the gas molecules in the container.

What we want
explained :

Why does decreasing
the volume (at constant
temperature) increase
the pressure?

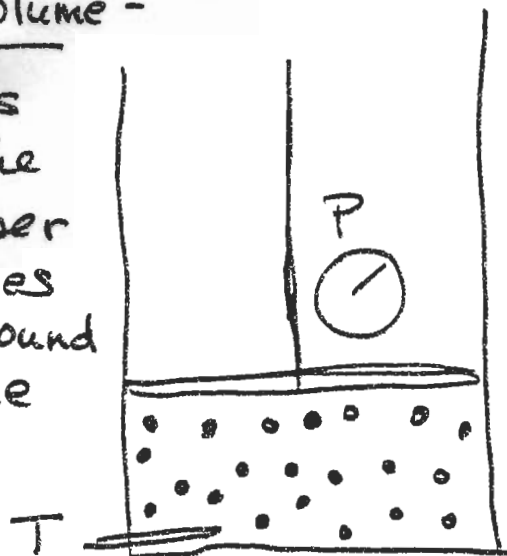
GAS IN A PISTON



Constant temp -
average speed
at which gas
molecules are
traveling stays
the same.

Decrease volume -

a lot less
room for the
same number
of molecules
to move around
at the same
speed.



Outcome -
molecules are
going to bang
into the walls
a lot more often



Pressure increases.