Subject: Physical Chemistry, paper-I (A)

Topic: Gaseous State

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seviation of real gases from ideal gas behaviour
The gas which obeys the ideal gas
equation (V=nK) competiting in the
and temperatures is called an ideal gas,
leut no gas has been found to obey
this equation compeletly as eindent
from bollowing figure.
He Boyle's law PV-K
PV 1 Regle's law PV-k N2 co2 Ideal gas Temperature and
to any of mole constant
Vene s in all maying thou
pressure >
"Imm pd1
All the existing gases are real gases and they
don't obey ideal gas equation compeletly,
this is due to two faulty assumption in
kinetic theory of gases.
[I] The total volume of gaseous molecule is
negligible in comparison to the volume of the
vessel. Filling x 2 To
r >0.11.03
[1] There acts neighber attractive nor repulsive
force among gaseous molecule

The deviation of a real gas from ideal gas
behaviour is more pronounced when the density
of the gas is high at high pressure and low
temperature. d= PM[RT]
Conversely, a real gas tends to behave as
an ideal gas at low pressure and high temperature
1 11 1
van der Waals equation >
van der Waals modified the ideal gas
equation [PV=nRT] so that real gases may also
obey it, for this purpose he made two
corrections in ideal gas equation.
e-V = oracioni hotorea)
(I) Volume correction ->
The gaseous molocules occupy some
spaces and therefore the space available to a
gaseous molecule to move is smaller than the
to rivolume of wessel. Comilar toutro out 17
1 trolong of Corrected volume = W-v
V - volume l'aproversel= de la bijai)
volume excluded by gaseous molecule
(10° = 30°
Let two molecules of a gas with radius & are
in a position to callide with each other, their
centers can't come closer than 2r.

volume of gaseous molocule - 4 23
volume of gaseous molocule 20 20 20 20 20 20 20 20 20 2
= 4 Nrs.
Volume excluded meetically by two molecules = 4 x (27)
on laber of the later of the second of the s
volume excluded mutually by one molecule = 4.4 m²
THE THE THE STATE OF THE STATE
molecules
volume excluded mutually by one mole molecules of gas = 4. Np. 4 xr3
The day of good 4. BH 3
you der blook equations =
og lashi all laighte = van der Waals constant.
do por mos los tode os frances de acolde - ph
volume excluded by n molecule of gas, 10 = nb
Corrected volume = V-v
= $mit = (0+nb).110V$
The general materials courty acres
van der Waals constant (b):->
The effective volume [which is 4 times
of the actual volume of Imol molecules of a
gas is called its ven der Words constant b.
Unit of b = hmedit
en dom manage pa hobulor develor tel
v= nb
mol mol

(IT) Pressure correction:
many of lead age (b) b)
Net attraction > or of so experiences an inward but
torce = 0
agent but some manage granisating and you deeded to
An attractive force acts among the
molecules of a gas but when a gaseous
molecule is in the Irelk, it experiences
zero net altractive force on the other hand
when a gaseous molecules is in position
to callide with the wall of vessel, it
experience inward peut
As a result molecule collid with the
- wall less effectively, therefore, the obserbed
pressure of gas is lower than that expected
in absence of intermolecular attraction.
Earn 10x01 - Er
Corrected pressure = P+p
P > obserbed pressure of gas.
p- decrease in pressure due to Inter-
molecular attraction.
Programme and the second secon
The decrease in pressure due to intermolecular
action is directly probablished to
of molecules colliding with the wall as well as number of malecules the line wall as well
as number of molecules behind the wall.
par number of molecules colliding with the wall a molar concentration of gas (n)
a moder as as a selliding with the wall
incentration of gas (n)

pa number of molecules behind the wall
of malax concentration of oak (n)
a molar concentration of gas (n).
i. pana
$\frac{pan^2 \cdot an}{an \cdot an} = \frac{b - an^2 \cdot an}{an \cdot an} = \frac{b - an^2 \cdot an}{an} = b - an^$
To the vote form on the langer to
where, a > proportationality constant
= van der Waals constant.
wires not see out loss of the lange to the mile with
Greater the value of 'a' greater will be the
decrease in pressure (p) and stronger will be the
intermolecular attraction.
In other words 'a' is the measure of
strength of intermolecular attractive force
He H2 O2 N2 CH4 CO2 NH3 Cl2 SO2 H20
value of 'a' increases
strength of intermolecular attractive force increases
and so los of the middle of the vettory
Unit of a = atm12mol-2
On putting corrected pressure and corrected volume
in the cideal gas equation PV = nRT.
- you pure showe it it is suprended up lasti
(P+p) (N-v) = mRTmol
1P+ 0-21+ (1/ 2b) - 20T
$\frac{(V-nb)}{v^2} = nRT$
- It is van der Waals equation for
n moles of real gas.
for I med of a real gas it becomes.
P+Q (V-b) = RT
$\frac{\left(P+Q\right)\left(V-W\right)}{\left(V^{2}\right)} = RT$