Semester-1 Chemistry Core -2

Unit-1 Gaseous State, Lecture-3 ,1. Relation between Kinetic Energy and Temperature

Relation between Kinetic Energy & Temperature

According to Kinetic gas equation, we have

$$P = \frac{1}{3V} m n \bar{c}^2$$

where

- P = pressure exerted by gas
- V = volume of the container
- m = mass of 1 molecule of gas
- n = no. of molecules
- $\bar{c}$ = Root Mean square velocity

Let $n = N_0$ = Avogadro's No $= 6.022 \times 10^{23}$

$mN_0 = M$ = Molar mass of gas = molecular mass of gas expressed in gms.

$$\therefore PV = \frac{1}{3} m N_0 \bar{c}^2 \quad \text{for 1 mole of gas molecules}$$

$$PV = \frac{1}{3} M \bar{c}^2$$

$$\Rightarrow 3PV = M\bar{c}^2$$

Multiplying both sides with 1/2

$$\Rightarrow \frac{3}{2} PV = \frac{1}{2} M \bar{c}^2$$

$$\therefore \frac{1}{2} M \bar{c}^2 = KE_{av} \text{ for 1 mole} = \frac{3}{2} PV$$

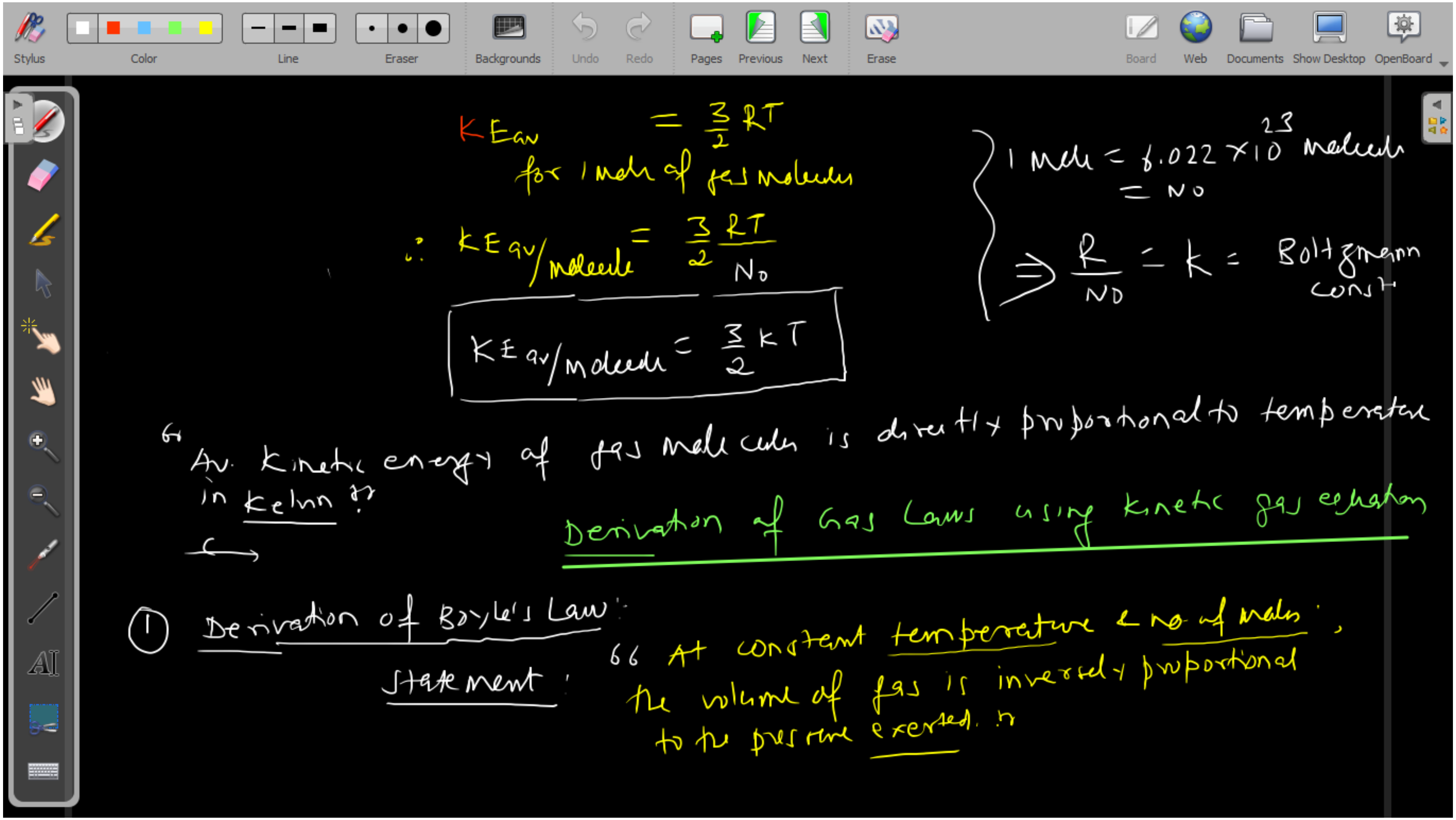
$$KE_{av} = \frac{1}{2} M \bar{c}^2$$

Ideal gas eqn for 1 mole: $PV = RT$

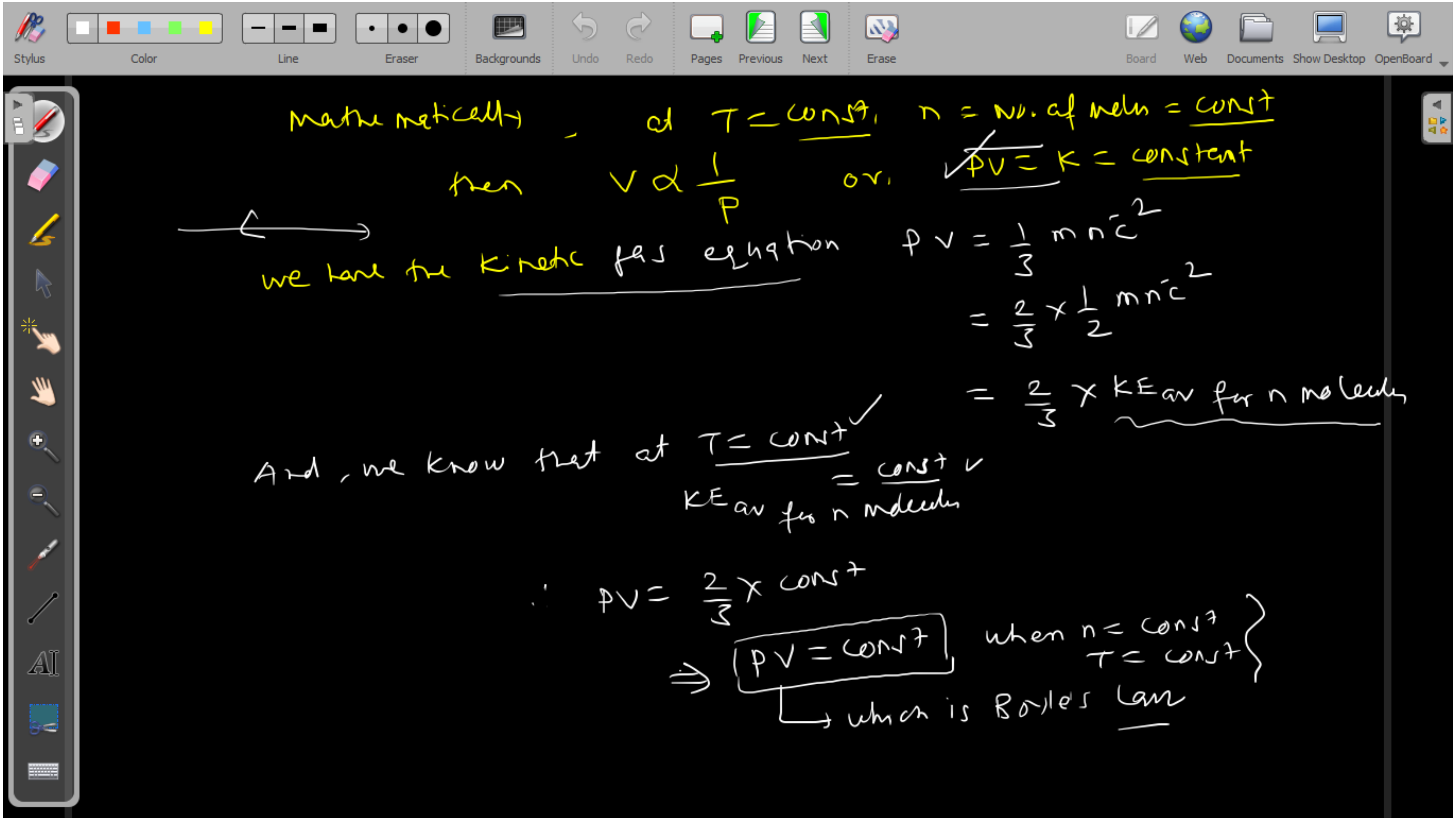
$$\therefore KE_{av} \text{ for mole} = \frac{3}{2} RT \Rightarrow KE_{av} \text{ for 1 mole} \propto T_K$$

Semester-1 Chemistry Core -2

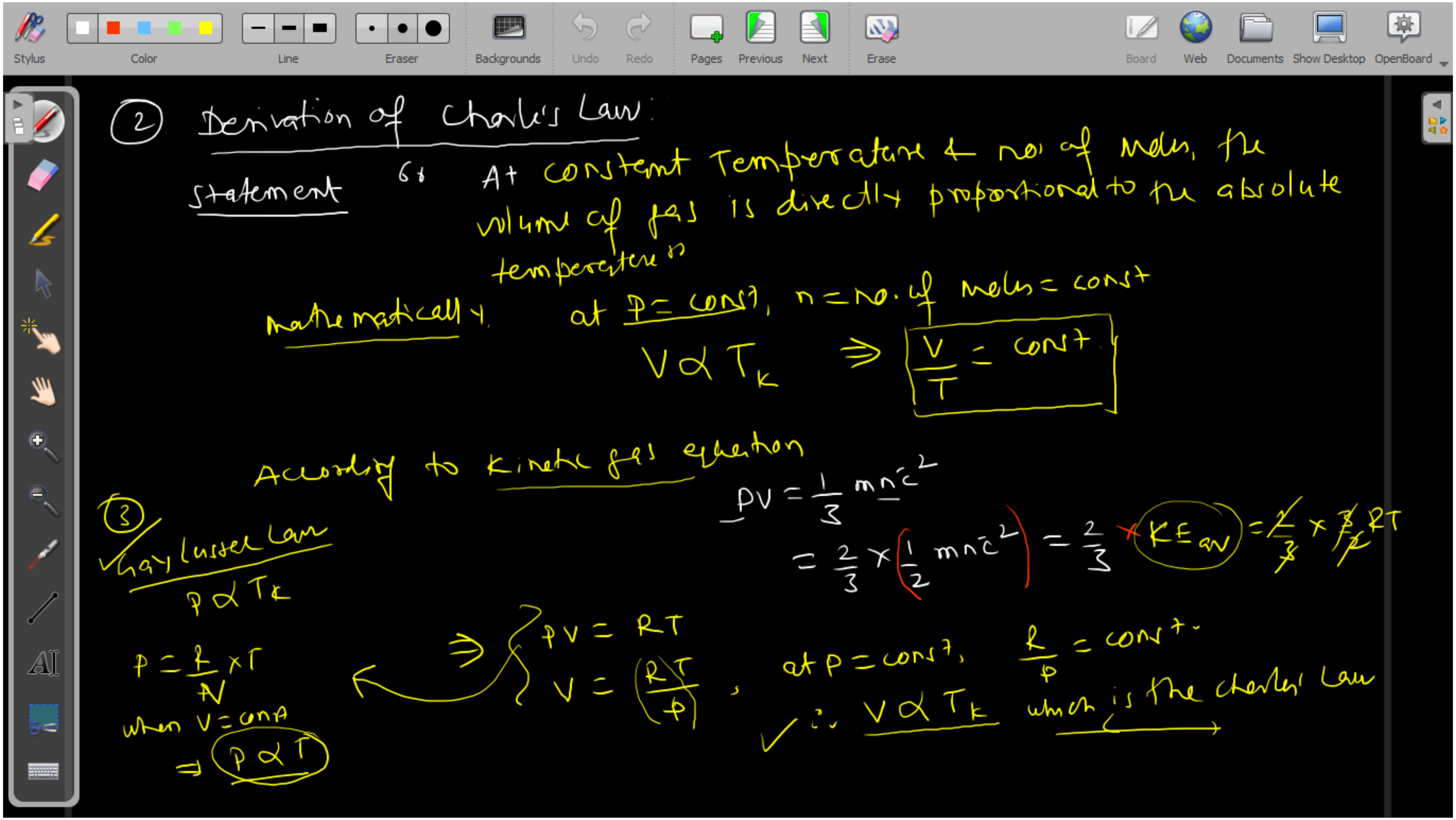
Unit-1 Gaseous State, Lecture-3 , 1.Relation between Kinetic Energy and Temperature



Unit-1 Gaseous State, Lecture-3 ,2. Derivation of Gas Laws using Kinetic Gas Equation

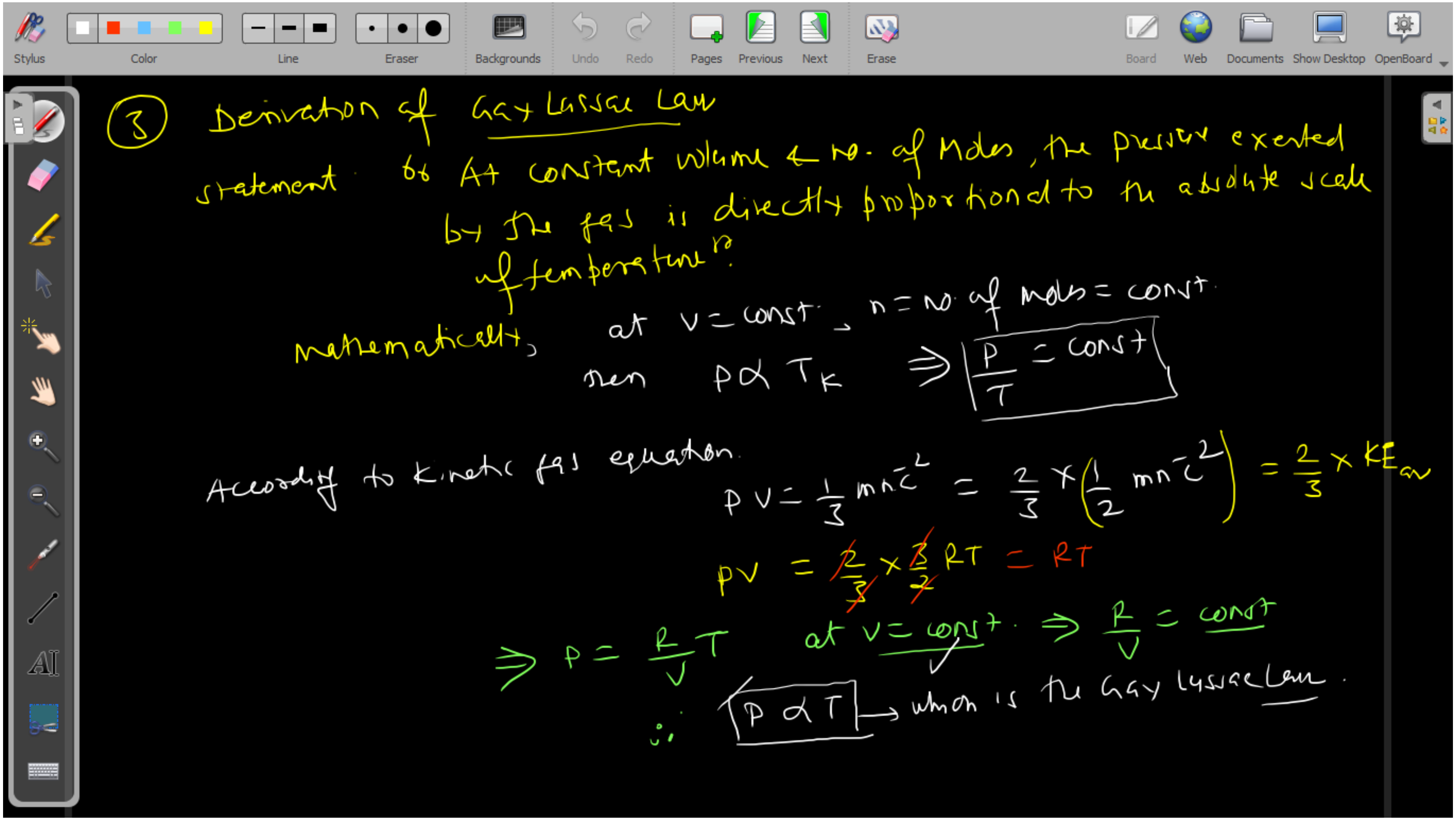


Unit-1 Gaseous State, Lecture-3 ,2. Derivation of Gas Laws using Kinetic Gas Equation



Semester-1 Chemistry Core -2

Unit-1 Gaseous State, Lecture-3 ,2. Derivation of Gas Laws using Kinetic Gas Equation



Unit-1 Gaseous State, Lecture-3 ,2. Derivation of Gas Laws using Kinetic Gas Equation