QUESTION:

Compounds 'A' and 'B' react according to the following chemical equation.

$A_{(g)} + 2B_{(g)} \rightarrow 2C_{(g)}$

The concentration of either 'A' and 'B' were changed keeping the concentrations of one of the reactants constant and rates were measured as a function of initial concentration. Following results were obtained. Choose the correct option for all the rate equations for this reaction.

Experiment	Initial concentration of [A]/mol L^{-1}	Initial concentration of [B]/mol L^{-}
1.	0.30	0.30
2.	0.30	0.60
3.	0.60	0.30

A Rate = $k[A]^2[B]$

B Rate = $k[A][B]^2$

C Rate = $k[A][B]$

D Rate = $k[A]^2[B]^0$

ANSWER:

Correct option is B)

Let order with respect to A and B are x and y respectively.

$\therefore$ Rate = $k(A)^x(B)^y$

$0.1 = k(0.3)^x(0.3)^y$....(i)

$0.4 = k(0.3)^x(0.6)^y$....(ii)

$0.2 = k(0.6)^x(0.3)^y$....(iii)

Dividing (ii) by (i):

$$\frac{0.4}{0.1} = \frac{(0.6)^y}{(0.3)^y}$$

$\therefore y = 2$

Dividing (iii) by (i):

$$\frac{0.2}{0.1} = \frac{(0.6)^x}{(0.3)^x}$$

$\therefore x = 1$

Rate law will be:

Rate = $k[A]^1[B]^2$.